

07-12-00

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REISSUEREISSUE PATENT APPLICATION TRANSMITTAL

Attorney Docket No. 68895

First Named Inventor or  
Application Identifier: James J. FITZGIBBON

Box REISSUE  
Commissioner of Patents and Trademarks  
ATTENTION: Assistant Commissioner  
for Patents  
Washington, D.C. 20231

Sir:

Transmitted herewith is the application  
for reissue of:

- (X) U.S. Utility Patent  
) Plant Patent  
) Design Patent

) CERTIFICATE OF MAILING BY "EXPRESS MAIL"

) "Express Mail" Mailing Label Number

) EL 560093326 US) Date of Deposit July 11, 2000

) I hereby certify that this paper or fee is being  
deposited with the United States Postal Service  
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under 37 CFR §1.10 on the date indicated above and  
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) (Typed or printed name of person mailing)

) *E. J. Gibbon*

) (Signature of person mailing)

No. 5,780,987 issued on July 14, 1998,Inventors: James J. Fitzgibbon and John V. Moravec

Title: BARRIER OPERATOR HAVING SYSTEM FOR DETECTING ATTEMPTED  
FORCED ENTRY

ENCLOSED ARE THE FOLLOWING:

1. (X) 73 pages of the specification and claims.  
(X) 1 page of abstract  
(X) 14 sheets of drawings ( ) Formal ( ) Informal.

2. (X) Drawings:

- (X) No changes in the drawings, upon which the original patent  
was issued, are to be made. Therefore, in accordance with  
37 C.F.R. §1.174(a), please find attached, in the size  
required for original drawings:

(X) a copy of the printed drawings of the patent.

( ) a photoprint of the original drawings.

- (X) a letter requesting transfer of the drawings from the  
original patent file to this reissued application is  
attached.

3. (X) Declaration

(X) 3 pages of Declaration (UNSIGNED).

4. (X) Inventorship:

( ) A newly-executed oath or declaration and power of attorney is enclosed (for continuation-in-part applications, or for continuation or divisional applications naming an inventor not named in the prior application) (§1.63(a), (d)(5) and (e)).

( ) Because this application is being filed by fewer than all of the inventors named in the prior application, delete the following inventor(s) named in the prior nonprovisional application (37 C.F.R. §1.63(d)(1)(2)):

\_\_\_\_\_.

(X) The names of persons believed to be the actual inventors are set forth in the enclosed unexecuted oath or declaration and power of attorney (§1.41(a) and §1.53(b)).

5. ( ) Assignment(s) of the invention to \_\_\_\_\_ and cover sheet are enclosed.

( ) A check in the amount of \$\_\_\_\_\_ to cover the fee for recording the assignment(s) is enclosed.

6. (X) The prior application is assigned of record to

The Chamberlain Group, Inc.

7. Letters Patent. Enclosed is:

- ( ) Original letters patent.
- ( ) Declaration that original letters patent lost or inaccessible.
- ( ) A copy of the original printed patent.

(X) Offer to surrender the original letters patent in accordance with 37 C.F.R. §1.178.

( ) Offer to surrender is by the inventor.

(X) Offer to Surrender is by assignee of the entire interest.

8. (X) Also enclosed:

- (X) Assent of Assignee to reissue
- (X) Certificate Under 37 C.F.R. §3.73(B)

9. ( ) A preliminary amendment is enclosed.

10. ( ) Small Entity Status (37 C.F.R. §1.28(a)(2)):

( ) A statement of status as a small entity is enclosed.

( ) A statement of status as a small entity was filed in the prior application, and small entity status is still proper and desired in this reissue application.

( ) Status as a small entity is no longer claimed.

11. (X) A separate written request under 37 C.F.R. §1.136(a)(3), which is a general authorization to treat any concurrent or future reply requiring a petition for an extension of time under 37 C.F.R. §1.136(a) for its timely submission as incorporating a petition for an extension of time for the appropriate length of time, is enclosed.

12. (X) An Information Disclosure Statement is enclosed.

(X) A Form PTO-1449 is enclosed.

(X) 3 References (copies) listed on the Form PTO-1449 are enclosed.

13. ( ) A MicroFiche Computer Program (Appendix) is enclosed.

14. (X) A Return Receipt Postcard is enclosed (MPEP §503).

15. ( ) A Nucleotide and/or Amino Acid Sequence Submission is enclosed.

( ) A Computer Readable Copy is enclosed.

( ) A Paper Copy (Identical to Computer Copy) is enclosed.

( ) A Statement Verifying Identity of above Copies is enclosed.

16. ( ) Priority of application number      /      filed on      in      is claimed under 35 U.S.C. §119.

( ) The certified copy of the priority document has been filed in prior application number      /     , filed     .

( ) A certified copy of the priority document is enclosed.

17. (X) Power of Attorney:

(X) The power of attorney in the U.S. patent is to:

(X) Kenneth H. Samples Reg. No. 25,747,  
FITCH, EVEN, TABIN, & FLANNERY  
Suite 1600  
120 South LaSalle Street  
Chicago, Illinois 60603-3406  
and other members of the firm.

( ) Customer Number 22242.

07/11/00  
jc841 U.S. PTO

- (X) The power appears in the original papers in the prior application.  
( ) Since the power does not appear in the original papers in the prior application a new power is enclosed.

18. (X) The filing fee is calculated below:

(X) Basic Fee	\$ 690.00	\$ <u>Deferred</u>
• (X) Independent Claims <u>8</u> - 3 = <u>5</u> x \$ 78.00 =	\$ <u>Deferred</u>	
• (X) Total Claims <u>40</u> - 20 = <u>20</u> x \$ 18.00 =	\$ <u>Deferred</u>	
• ( ) Fee for Multiply Dependent Claims	\$260.00	\$ <u>0</u>
or		
( ) Basic Design Fee	\$ 310.00	\$ _____
Total of above Calculations		\$ <u>Deferred</u>
Reduction by 50% for Filing by Small Entity		\$ _____
Total		\$* <u>Deferred</u>

20. (X) **\*PAYMENT OF THE FILING FEE IS TO BE DEFERRED UNTIL FILING OF THE SIGNED DECLARATION. DO NOT CHARGE OUR DEPOSIT ACCOUNT.**
21. (X) The Commissioner is hereby authorized to charge any fees which may be required under 37 C.F.R. §§1.16 and 1.17 and are not paid herewith, or credit any overpayment, to Deposit Account Number 06-1135. A duplicate copy of this request is enclosed.
- 22 (X) Address all future communications to Customer Number 22242.



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July 11, 2000  
(Date)

Kenneth H. Samples  
Kenneth H. Samples  
Registration No. 25,747  
(x) Attorney or agent of record  
( ) Filed under §1.34(a)

REISSUE  
ATTORNEY DOCKET  
No. 68893

1c808 U.S.  
09/614222  
07/11/00

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Reissue of U.S. Patent  
No. 5,780,987

Applicants:	James J. FITZGIBBON	)	<u>CERTIFICATE OF MAILING BY "EXPRESS MAIL"</u>
	John V. MORAVEC	)	"Express Mail" Mailing Label Number
Application No.:	N/A	)	<u>EL 560093326 US</u>
Filed:	Concurrently Herewith	)	Date of Deposit <u>July 11, 2000</u>
Title:	BARRIER OPERATOR	)	I hereby certify that this paper or fee is
	HAVING SYSTEM FOR	)	being deposited with the United States
	DETECTING ATTEMPTED	)	Postal Service "Express Mail Post Office
	FORCED ENTRY	)	to Addressee" Service under 37 CFR §1.10
Group		)	on the date indicated above and
Art Unit:	N/A	)	is addressed to the Commissioner of
Examiner:	N/A	)	Patents and Trademarks, Washington, D.C.
		)	20231.
		)	<u>ED PRICE</u>
		)	(Typed or printed name of person mailing)
		)	<u><i>Ed Price</i></u>
		)	(Signature of person mailing)

ASSENT OF ASSIGNEE TO REISSUE

Box REISSUE  
Honorable Commissioner of Patents  
and Trademarks  
ATTENTION: Assistant Commissioner for Patents  
Washington, D.C. 20231

Sir:

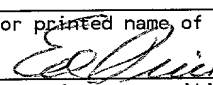
THE CHAMBERLAIN GROUP, INC., the assignee of the entire title and interest in United States Patent No. 5,780,987, by reason of an assignment from the inventors recorded in the United States Patent and Trademark Office on October 13, 1995 at Reel 7766, Frame 0524, hereby assents to the filing of the above-captioned application for reissue of said U.S. Patent No. 5,780,987. A Certification Under 37 C.F.R. §3.73(B) accompanies this Assent.

THE CHAMBERLAIN GROUP, INC.

Dated: July 7, 2000 By: *Mark B. Tone*  
Mark B. Tone  
Title: Vice President

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Reissue of U.S. Patent  
No. 5,780,987

Applicants:	James J. FITZGIBBON	)	<u>CERTIFICATE OF MAILING BY "EXPRESS MAIL"</u>
	John V. MORAVEC	)	"Express Mail" Mailing Label Number
		)	EL 560093326 US
Application No.:	N/A	)	
Filed:	Concurrently Herewith	)	Date of Deposit <u>July 11, 2000</u>
Title:	BARRIER OPERATOR	)	I hereby certify that this paper or fee is
	HAVING SYSTEM FOR	)	being deposited with the United States
	DETECTING ATTEMPTED	)	Postal Service "Express Mail Post Office
	FORCED ENTRY	)	to Addressee" Service under 37 CFR §1.10
Group		)	on the date indicated above and
Art Unit:	N/A	)	is addressed to the Commissioner of
		)	Patents and Trademarks, Washington, D.C.
Examiner:	N/A	)	20231.
		)	ED PRICE
		)	(Typed or printed name of person mailing)
		)	
		)	(Signature of person mailing)

CERTIFICATE UNDER 37 C.F.R. §3.73(B)

Box REISSUE  
Commissioner of Patents and Trademarks  
ATTENTION: Assistant Commissioner for Patents  
Washington, D.C. 20231

Sir:

This Certificate is being filed in connection with the above-captioned reissue application filed under cover herewith, of application 08/888,836, filed July 7, 1997, now U.S. Patent No. 5,780,987, issued July 14, 1998. The reissue application filed under cover herewith is called "the present application" herein.

The Chamberlain Group, Inc., a corporation, certifies that it is the assignee of the entire right, title and interest in the present application by virtue of:

A chain of title from the inventors, of the present patent application to the current assignee as shown below:

From James F. Fitzgibbon and John V. Moravec, to The Chamberlain Group, Inc. The document was recorded in the Patent and Trademark Office at Reel 7766, Frame 0524.

A copy of the Assignment in the chain of title is attached.

The undersigned (whose title is supplied below) is empowered to sign this certificate on behalf of the Assignee identified above.

I hereby declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further, that these statements are made with the knowledge that willful false statements, and the like so made, are punishable by fine or imprisonment, or both, under Section 1001, Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date:

July 7, 2000  
\_\_\_\_\_  
Mark B. ToneTitle: Vice President

**ASSIGNMENT**

We, JAMES J. FITZGIBBON, residing at 10 Carol Ann Drive, Streamwood and JOHN V. MORAVEC, residing at 212 Hinricher Drive, Willow Springs, both of the County of Cook and State of Illinois, for good and valuable consideration, receipt of which is hereby acknowledged, have assigned and do hereby assign to THE CHAMBERLAIN GROUP, INC., a Connecticut corporation having its principal place of business at 845 Larch Avenue, Elmhurst, Illinois, its successors, assigns and legal representatives, the entire right, title and interest in and to all subject matter invented by us and disclosed in the application for Letters Patent of the United States entitled

**BARRIER OPERATOR HAVING SYSTEM FOR  
DETECTING ATTEMPTED FORCED ENTRY**

Serial No. 443,178, filed May 17, 1995, and in and to all Letters Patent and all Convention and Treaty rights of all kinds, in all countries throughout the world, for all such subject matter. We agree to sign all documents necessary to secure all said Letters Patent and rights, and request issuance of all said Letters Patent to the above assignee in accordance with this Assignment.

Date: July 18, 1995

Date: July 18, 1995

  
JAMES J. FITZGIBBON

  
JOHN V. MORAVEC



STATE OF ILLINOIS     )  
                                  ) SS  
COUNTY OF DuPAGE    )

I hereby certify that, before me in the County of DuPage in the State of Illinois, personally appeared JAMES J. FITZGIBBON, personally known to me to be the person whose name is subscribed to the within instrument, and acknowledged that he executed it.

Witness my hand and official seal.

Date: July 19, 1995

M. Dianne Smith  
Notary Public  
My Commission Expires 9-4-98

STATE OF ILLINOIS     )  
                                  ) SS  
COUNTY OF DuPAGE    )



I hereby certify that, before me in the County of DuPage in the State of Illinois, personally appeared JOHN V. MORAVEC, personally known to me to be the person whose name is subscribed to the within instrument, and acknowledged that he executed it.

Witness my hand and official seal.

Date: July 19, 1995

M. Dianne Smith  
Notary Public  
My Commission Expires 9-4-98



# BARRIER OPERATOR HAVING SYSTEM FOR DETECTING ATTEMPTED FORCED ENTRY

This application is a continuation of application Ser. No. 5  
08/443,178 filed May 17, 1995, now abandoned.

## BACKGROUND OF THE INVENTION

The invention relates, in general, to barrier operators and, in particular, to a garage door operator including a system 10 for detecting when an attempt is made to force open a closed garage door.

Several garage door operator systems are available on the market for maintaining a garage door either in a closed or open position. It is clear that the systems should be relatively 15 easy to use and should be able to open the door relatively rapidly to allow quick and easy access to the garage. In addition, many systems are provided which include detectors, pressure detectors and the like that sense when the garage door is being brought down and the bottom edge of 20 the door comes in contact with an obstacle prior to the door reaching the fully closed position. These systems are important because they prevent the garage door from closing on people, pets or small objects and, therefore, prevent personal injury and property damage. One of the drawbacks of such 25 systems, however, is that for some such systems, when the door has been closed, if a lifting force is applied to the door, for instance by an unwanted intruder grabbing the handle of the door and attempting to raise it by jacking the door or the like, some systems through a force measurement routine, 30 automatically cause the door to be opened, in order to prevent what the garage door operator senses might be potential harm. Of course, if the person operating the door is attempting to break and enter the garage for nefarious purposes and it is important that while the system prevents 35 harm, the system also be provided such that the door cannot be forced open if the operator does not want it to be and if no persons or property are in danger.

A system available from the Stanley Company provides a garage door operator having upper travel limit and lower 40 travel limit switches associated therewith. The switches may be set or moved so that the limits of travel may be changed. In the Stanley system, for instance, if the door has reached a nominal closed position and the operator has its down limit switch position changed, the door will actually dynamically 45 track changes in the switch position and open or close according to switch commands.

Mechanical systems may be available that, in effect, jam the door closed; however, once these systems are placed in effect, if a person not knowing that the door is down and 50 effectively mechanically locked attempts to open the door the garage door operator then attempts to lift the door against the locking mechanism and the garage door operator may be inadvertently damaged thereby or, at the very least, not open 55 the door because it is locked.

What is needed then is a system which provides a sensing modality for a garage door or other barrier operator which, while maintaining all safety features to prevent personal injury or property damage due to unwanted closing of the door, nevertheless senses when an intruder attempts to open 60 the door and prevents the door from being opened by a positive drive force provided by the garage door operator motor.

## SUMMARY OF THE INVENTION

The invention relates, in general, to a barrier system operator and, in particular, to a garage door operator which 65

while having all safety features for preventing personal injury and property damage due to inadvertent closing of the garage door, nevertheless provides a positively actuated door closure system which prevents forcing the door once it has closed without having detected any objects underneath it. The system includes a barrier drive including an electric motor which may be connected to a belt, chain or screw drive. Means are provided for detecting motion of the movable barrier. These means may include a motor tachometer, upper and lower limit switches and the like. Means are also provided for detecting when a barrier command signal has been given to the barrier drive so that when a door has been commanded by a radio frequency control, the keypad control, indoor wired control or the like to open, the door may be automatically opened. The system also includes a storage device for storing the commanded state of the barrier drive which may be a microcontroller or a microprocessor in combination with a memory or some other integrated circuit device capable of storing digital or analog information. The commanded state is stored and is then compared in a comparator means with the position indicated by the barrier detection. In the event that the comparison of the barrier state signal and the barrier position signal indicates that the system already has been in a lowered position, usually for given time intervals, such as 27 seconds and attempt is made to raise the door causing unwanted motion of the door when there has been no up command given, an alarm signal is generated which may be passed through electronic and electromechanical logic to the door motor causing the door motor to provide thrust to the door to hold the door in the closed position.

In the alternative, the system may also provide a signal to operate a visual or audio alarm or to call over a telephonic or other wired system to a police department or to a security service to indicate that the system is being broken into.

It is a principal object of the present invention to provide a barrier operator for opening and closing a movable barrier which includes an electronic system for detecting when forced entry is being attempted on the carrier and for preventing the barrier from being opened.

Other objects of this invention will become obvious to one of ordinary skill in the art upon a perusal of the following specification and claims in light of the accompanying drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of an apparatus comprising a garage door operator and embodying the present invention:

FIG. 2 is a block diagram of a portion of the head unit and associated controls of the apparatus shown in FIG. 1:

FIG. 3 is a schematic diagram showing details of the circuit shown in FIG. 2:

FIG. 4 is a flow chart of a top level flow diagram for the apparatus embodying the present invention:

FIG. 5 is a flow diagram of an upper limit routine:

FIGS. 6A and 6B are a flow diagram controlling travel upward:

FIG. 7 is a flow diagram of a down limit routine:

FIGS. 8A and 8B are a flow chart of a downward or closing movement routine:

FIG. 9 is a flow chart of a barrier closed routine: and

FIG. 10 is a flow chart of an auto-reverse time delay routine.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings and especially to FIG. 1, more specifically a movable barrier door operator or garage

door operator is generally shown therein and includes a head unit 12 mounted within a garage 14. More specifically, the head unit 12 is mounted to the ceiling of the garage 14 and includes a rail 18 extending therefrom with a releasable trolley 20 attached having an arm 22 extending to a multiple paneled garage door 24 positioned for movement along a pair of door rails 26 and 28. The system includes a hand-held transmitter unit 30 adapted to send signals to an antenna 32 positioned on the head unit 12 and coupled to a receiver as will appear hereinafter. An external control pad 34 is positioned on the outside of the garage having a plurality of buttons thereon and disposed to communicate via radio frequency transmission with the antenna 32 of the head unit 12. An optical emitter 42 is connected via a power and signal line 44 to the head unit. An optical detector 46 is connected via a wire 48 to the head unit 12.

The head unit 12 has a wired wall control panel 43 connected to it via a line or wire 43a, as is shown in FIG. 2. More specifically, the wall control panel 43 is connected to a charging circuit 70 and a discharging circuit 72 coupled via respective lines 74 and 76 to a wall control decoder 78. The wall control decoder 78 decodes closures of a plurality of switches 80, 82 and 84 in the wall circuit. The wall control panel also includes a light emitting diode 86 connected by a resistor 88 to the line 43a and to ground. Switch 80 is the command switch, switch 82 is the work light switch and switch 84 is the vacation switch. Switch closures are decoded by the wall decoder 78 which sends signals along lines 90 and 92 to a motor control 94 coupled via motor control lines 96 to an electric motor 98 positioned within the head unit. A tachometer 100 receives a mechanical feed from the motor 98 and provides feedback signals on lines 102 to the motor controller.

The receiver unit also includes an antenna 110 coupled to receive radio frequency signals either from the fixed RF keypad 34 or the hand-held transmitter 30. The RF signals are fed to a radio frequency receiver 112 where they are buffer amplified and supplied to a bandpass circuit 114 which outputs low frequency signals in the range of 1 Hz to 1 kHz. The low frequency signals are fed to an analog-to-digital converter 116 that sends digitized code signals to a radio controller 118. The radio controller 118 is also connected to receive signals from a non-volatile memory 120 over a non-volatile memory bus 122 and to communicate via lines 124 and 126 with the motor controller 94. A timer 128 is also provided, coupled via lines 130 with the radio controller, a line 132 with the motor controller and a line 134 with the wall control decoder 78. A barrier travel limit detection device 190 includes an up limit detector 190a and a down limit detector 190b that sends signals to pins P20 and P21 of the microcontroller 282. The obstacle detector comprising the emitter 42 and detector 46 send signals to pins P03 and P30 of the microcontroller 282 indicating when an obstacle is blocking the path of the door.

Referring now to FIG. 3, the system shown in FIG. 3 is shown therein with the antenna 110 coupled to a reactive divider network 250, comprised of a pair of series connected inductances 252 and 254 and capacitors 256 and 258, which supplies an RF signal to the buffer amplifier 112 having an NPN transistor 260 connected to receive the RF signal at its emitter 261. The NPN transistor 260 has a capacitor 262 connected to it for power supply isolation. The buffer amplifier 112 provides a buffered radio frequency output signal on a lead 268. The buffered RF signal is fed to an input 270 which forms part of a super-regenerative receiver 272 having an output at a line 274 coupled to the bandpass filter 114 which provides output to a comparator 278. The

bandpass filter 114 and analog-to-digital converter provide a digital level output signal at a lead 280 which is supplied to an input pin P32 of an 8-bit Zilog microcontroller 282.

The microcontroller 282 may have its mode of operation controlled by a programming or learning switch 300 positioned on the outside of the head unit 12 and coupled via a line 302 to the P26 pin of the microcontroller 282. The wired control panel 43 is connected via the lead 43a to input pins P06 and P07. The microcontroller 282 has a 4 MHz crystal 328 connected to it to provide clock signals. A force sensor 330 includes a bridge circuit having a potentiometer 332 for setting the up force and a potentiometer 334 for setting the down force, respectively connected to inverting terminals of a first comparator 336 and a second comparator 338. The comparator 336 sends an up force signal over a line 339a. The comparator 338 sends a down force signal over the line 339b, respectively to pins P04 and P05 of the 8-bit microcontroller 282. Although details of the operation of the microcontroller in conjunction with other portions of the circuit will be discussed hereinafter, it should be appreciated that the P01 pin of the microcontroller is connected via a resistor 350 to a line 352 which is coupled to an NPN transistor 354 that controls a light relay 356 which may supply current via a lead 358 to a light in the head unit or the like. Similarly, the pin P000 feeds an output signal on a line 360 to a resistor 362 which biases a base of an NPN transistor 364 to cause the transistor 364 to conduct, drawing current through the coil of the relay an up relay 366 causing an up motor command to be sent over a line 96 to the motor 98. Finally, the P02 pin sends a signal through a line 370 to a resistor 372 via a line 374 to the base of an NPN transistor 376 connected to control current through a coil of a down control relay 378 which is coupled by one of the leads to the motor 98 to control motion of the motor 98.

Electric power is received on a hot AC line 390 and a neutral line AC line 392 which are coupled to a transformer 393 at its primary winding 394. The AC is stepped down at a secondary winding 395 and is full wave rectified by a full wave rectifier 396. It may be appreciated that, in the alternative, a half wave rectifier may also be used.

A plurality of filter capacitors 398 receive the full wave rectified fluctuating voltage and remove some transients from the voltage supplying a voltage with reduced fluctuation to an input of a voltage regulator 400. The voltage regulator 400 produces a 5-volt output signal available at a lead 402 for use in other portions of the circuit.

Referring now to FIG. 4, a top level routine is shown therein which is entered every two milliseconds upon a timing interrupt in a step 500. The routine then enters a variety of other routines depending upon the value of a state number. When the state number is 2 an upper limit routine is entered in a step 502. If the state number is 1, a traveling up routine is entered in a state 504. If the state is 5, a down limit routine is entered in a step 506. If the state is 4, a traveling down routine is entered in a step 508. If the state is 6, a barrier halt or stopped in middle routine is entered in a step 510. If the state is 0, an auto-reverse time delay routine is entered in a step 512. When any of the aforementioned routines 502 through 512 are exited, a return step 514 is entered and other portions of code not pertinent to this invention are executed.

In the event that the state equals 2, the routine 502 is entered as may best be seen in FIG. 5 wherein the upper limit switch has indicated that the door has reached the upper end of its authorized travel, the motor is switched off and a watchdog timer is started in a step 514. The work light

command flag is set in step 516 to toggle the work light on. In a step 518, a radio command or wall control command flag is tested for and, if set, the state is set to 4. In a step 520, the routine is exited and return is switched to the step 514. In the event that the state has been set equal to 4, in step 518 at the next 2 millisecond interval, control is transferred to the routine 508.

In the event that the state has been set equal to 1, control is transferred to a barrier traveling up or a barrier opening routine shown in FIGS. 6A and 6B. In a step 522, the work light is turned on and in the event that the light was off, a delay of 40 milliseconds is then provided to turn on the up motor output, the down motor output is turned off and the hold door closed flag is cleared. In a step 524, after a start up delay of 1 second the rpm period of the tachometer is tested against the look up force and if the rpm period is too brief, a state is set to indicate that the door has stopped in mid travel. In a step 526, a test is made to determine whether the one second timer has exceeded one second and whether the rpm period is below the set force limit indicating that the door has been halted in an unwanted manner. If it is not, control is transferred to a step 528 wherein the state variable is set to 6, following which the routine is exited in a step 530. In the event that the decision in step 526 is positive, the up limit input is tested. If the voltage is low, it is increased. If it is high, the debounce is decreased. Control is then transferred to a test step 532 to test whether the limit debounce is greater than 24 milliseconds. If it is, the state is set equal to 2 in a step 534 and the routine is exited in a step 536. If the limit debounce is less than 24 milliseconds, control is transferred to a step 540 where a 27 second time out is decremented and tested for. If the time out is zero, the state is set as indicating that the door has stopped in mid travel. A step 542 is executed to test for either a radio or wall control command flag having been set and, if so, the state is set as stop in mid travel. The routine is then executed in a step 544.

In the event that the state has been set equal to 5, a routine 506 to handle down limits, as shown in FIG. 7, is entered. In a step 550, a hold door closed flag is tested to determine whether it is set or not. If it is not set, control is transferred to a step 552 to determine whether the 27 seconds timer has timed out following the down limit having been set, indicating that the door has safely closed and did not contact an obstruction or obstacle. In the event that the hold door closed flag has been set, as tested for in step 550, control is transferred to a step 554 testing whether the down limit indicates the door is open and whether the motor has been given enough current or turned on long enough to provide 10 rpm pulses. In the event that the 27 second clock has not been timed out as indicated by step 552, control is transferred to a step 556, switching the motor off, and starting a watchdog timer. Control is then transferred to a step 558 to determine if the work light command flag has been set and, if it has, the work light is toggled. Control is then transferred to a step 560, testing for whether there is a radio command or wall control command flag. If so, the state is set equal to 1 and the routine is exited in a return step 562. In the event that the down limit does not indicate that the door is open and the motor has been turned enough to give 10 rpm pulses, control is transferred to a step 564 setting the state equal to 4 and setting the hold door closed flag. The state equal 4 indicates that the door is to be traveling down, thereby causing the barrier to close after the 27 second limit has timed out.

In the event the state has been set equal to 4 to command the door to travel down, the routine 508 is entered as shown

in FIGS. 8A and 8B. In a step 570, the work light is turned on, and if the light had previously been off, a delay of 40 milliseconds occurs following which down motor output is turned on and the up motor output is turned off, the watchdog is also started. In a step 572, a test is made to determine whether the 1 second timer has exceeded 1 second and whether the rpm period is indicative of a force limit having been exceeded. If so, indicating that the door is stalled on an obstacle, control is transferred to a step 574, setting a state equal to zero and the routine is exited in a step 576. If the door has not been indicated to be stalled by the step 572, control is transferred to a step 578 testing the status of the down limit input. If it is low, the debounce is increased. If it is high, the debounce is decreased. In a step 580, the limit debounce is tested to determine whether it is greater than or equal to 24 milliseconds. If it is, the state is set equal to 5 in a step 582 and the routine is exited in a step 584. If it is not, the 27 second time out is decremented and tested to determine if it is zero. If it is zero, the state is set equal to zero in a step 586. In a step 588, a test is made to determine whether the radio or wall control command flag has been set and, if so, the state is then set equal to 6. In a step 590, as shown in FIG. 8B, the timer associated with the optical detector is tested to determine whether it is greater than 10 milliseconds and, if it is, indicating that an obstacle is blocking the light path, the state is set equal to zero to cause the auto-reverse routine 512 to be entered following exiting from this routine. It will be entered on the next interrupt which is in less than 2 milliseconds. Control is then transferred to a step 592, testing whether the motor speed indicated that the door had been forced upward. If it is not, the routine is exited in a step 594. If the rpm sensing indicates that the door has been forced upward, a test is made in the step 596 to determine if the command is still valid, indicating the door is to move upward. If it is not, control is transferred to a step 598 setting the state equal to zero which will cause the door to auto reverse and move down. Control is then transferred to a step 600 exiting the routine.

In the event that the state has been set equal to 6, the routine 510 shown in FIG. 9 is entered. A test is made to determine whether the motor motion indicates that the door has been forced upward. If so, a flag is set to turn off the light and the electric motor is switched off and the watchdog is started. If the work light command flag has been set in a step 604, the work light is then toggled. In a step 606, a test is made to determine whether the radio command or wall control command flag has been set and, if it has, the state is then set equal to 4 which will cause entry of the traveling down routine 508. The routine is then exited in a step 608.

In the event that the state has been set equal to zero indicating that an auto reverse is to be commanded, the routine 512 is entered in a step 620, the motor is turned off and a watchdog timer is started. In the step 622, the delay timer is decreased and if 0.5 seconds has expired, the state is set equal to 1 to cause the door to travel upward on the next 2 millisecond interrupt. In a step 624, a test is made for the radio command or wall control command flag being set. If it has, the stopped in middle routine 510 will be entered on the next interrupt. The routine 512 is then exited in a step 626.

While there has been illustrated and described a particular embodiment of the present invention, it will be appreciated that numerous changes and modifications will occur to those skilled in the art, and it is intended in the appended claims to cover all those changes and modifications which fall within the true spirit and scope of the present invention.

5.780.987

7

8

NON-VOL MEMORY MAP

00	A1
01	A1
02	A2
03	A2
04	A3
05	A3
06	A4
07	A4
08	A5
09	A5
0A	A6
0B	A6
0C	A7
0D	A7
0E	A8
0F	A8
10	A9
11	A9
12	A10
13	A10
14	A11
15	A11
16	A12
17	A12
18	B
19	B
1A	C
1B	C
1C	CYCLE COUNTER 1ST 16 BITS
1D	CYCLE COUNTER 2ND 16 BITS
1E	VACATION FLAG
1F	A MEMORY ADDRESS LAST WRITTEN



20-2F OPERATION BACK TRACK

30-3F FORCE BACK TRACE

## RS232 DATA

INPUT	OUTPUT
30H	SWITCH STATUS XXXXXXXX0 UP LIMIT OPEN XXXXXXXX1 UP LIMIT CLOSED XXXXXX0X DOWN LIMIT OPEN XXXXXX1X DOWN LIMIT CLOSED XXXXX0XX COMMAND OPEN XXXXX1XX COMMAND CLOSED XXXX0XXX WORKLIGHT OPEN XXXX1XXX WORKLIGHT CLOSED XXX0XXXX VACATION OPEN XXX1XXXX VACATION CLOSED
31H	SYSTEM STATUS XXXXSSSS STATE DATA XXX0XXXX NOT IN LEARN MODE XXX1XXXX IN LEARN MODE XX0XXXXX NOT IN VACATION MODE XX1XXXXX IN VACATION MODE X0XXXXXX LIGHT OFF X1XXXXXX LIGHT ON 0XXXXXXX AOBS OK 1XXXXXXX AOBS ERROR
32H	RPM PERIOD RETURNED HIGH BYTE RETURNED LOW BYTE
33H	FORCE RETURNED DOWN FORCE RETURNED UP FORCE
34H	RADIO MEMORY CODES PAGE 00 32 BYTES
35H	RADIO MEMORY CODES PAGE 10 32 BYTES
36H	OPERATION HISTORY PAGE 20 32 BYTES
37H	FORCE HISTORY PAGE 30
38H	MEMORY TEST AND ERASE ALL! 00 OK

## FF ERROR

39H SET PROGRAM MODE

## REASON

00 COMMAND  
 10 RADIO COMMAND  
 20 FORCE  
 30 AUX OBS  
 40 A REVERSE DELAY  
 50 LIMIT  
 60 EARLY LIMIT  
 70 MOTOR MAX TIME, TIME OUT  
 80 MOTOR COMMANDED OFF RPM CAUSING AREV  
 90 DOWN LIMIT WITH COMMAND HELD  
 A0 DOWN LIMIT WITH THE RADIO HELD  
 B0 RELEASE OF COMMAND OR RADIO AFTER A FORCED  
 UP MOTOR ON DUE TO RPM PULSE WITHG MOTOR OFF

## STATE

00 AUTOREVERSE DELAY  
 01 TRAVELING UP DIRECTION  
 02 AT THE UP LIMIT AND STOPED  
 03 ERROR RESET  
 04 TRAVELING DOWN DIRECTION  
 05 AT THE DOWN LIMIT  
 06 STOPPED IN MID TRAVEL

## DIAG

- 1) AOBS SHORTED
- 2) AOBS OPEN / MISS ALIGNED
- 3) COMMAND SHORTED
- 4) PROTECTOR INTERMITTENENT
- 5) CALL DEALER
  - A) NO RPM IN THE FIRST SECOND
  - B) RPM FORCED A REVERSE
  - C)

## DOG 2

DOG 2 IS A SECONDARY WATCHDOG USED TO  
 RESET THE SYSTEM IF THE LOWEST LEVEL "MAINLOOP"  
 IS NOT REACHED WITHIN A 3 SECOND

## EQUATE STATEMENTS

```

check_sum_value      .equ  09AH
TIMER_0              .EQU  10H
TIMER_0_EN           .EQU  03H
TIMER_1_EN           .EQU  0CH

MOTOR_HI             .EQU  034H
MOTOR_LO             .EQU  0BCH
PWM_CHARGE           .EQU  00H
PWM_DISCHARGE        .EQU  01H
LIGHT                .EQU  0FFH
LIGHT_ON             .EQU  02H
MOTOR_UP             .EQU  01H
MOTOR_DN             .EQU  04H
DN_LIMIT             .EQU  02H
UP_LIMIT             .EQU  01H
DIS_SW               .EQU  10000000B
CDIS_SW              .EQU  01111111B
SWITCHES             .EQU  01000000B
CHARGE_SW            .EQU  00100000B
CCHARGE_SW           .EQU  11011111B
PWM_HI               .EQU  10H
COMPARATORS          .EQU  30H
DOWN_COMP            .EQU  20H
UP_COMP              .EQU  10H
PWM_DIS              .EQU  20H
P01M_INIT            .EQU  01000100B ; set mode p00-p03 out p04-p07in
P2M_INIT             .EQU  01100011B
P3M_INIT             .EQU  00000011B ; set port3 p30-p33 input ANALOG mode
P01S_INIT            .EQU  00000010B
P2S_INIT             .EQU  10000011B
P3S_INIT             .EQU  00000000B

FLASH                .EQU  0FFH
WORKLIGHT            .EQU  02H

COM_CHARGE           .EQU  2
WORK_CHARGE          .EQU  20
VAC_CHARGE           .EQU  80

COM_DIS              .EQU  01
WORK_DIS             .EQU  04
VAC_DIS              .EQU  24

CMD_TEST             .EQU  00
WL_TEST              .EQU  01
VAC_TEST             .EQU  02
CHARGE               .EQU  03

AUTO_REV             .EQU  00H
UP_DIRECTION          .EQU  01H
UP_POSITION           .EQU  02H
DN_DIRECTION          .EQU  04H

```

```

DN_POSITION      EQU 05H
STOP             EQU 06H
CMD_SW           EQU 01H
LIGHT_SW         EQU 02H
VAC_SW           EQU 04H

```

---

 PERIODS
 

---

```

LIMIT_COUNT      EQU 0FH          ; limit debounce 1 way 32mS
AUTO_HI          EQU 00H          - , auto rev timer 5 sec
AUTO_LO          EQU 0F4H
MIN_COUNT        EQU 04H          ; pwm start point
TOTAL_PWM_COUNT  EQU 03FH        ; pwm end = start + 4*total-1
FLASH_HI         EQU 00H          ; 25 sec flash
FLASH_LO         EQU 07AH
SET_TIME_HI      EQU 02H          ; 4.5 MIN
SET_TIME_LO      EQU 02H          ; 4.5 MIN
SET_TIME_PRE     EQU 0FBH        ; 4.5 MIN
ONE_SEC          EQU 0F4H        ; WITH A /2 IN FRONT
CMD_MAKE         EQU 8D          ; cycle count *10mS
CMD_BREAK        EQU (255D-8D)
LIGHT_MAKE       EQU 8D          ; cycle count *11mS
LIGHT_BREAK      EQU (255D-8D)
VAC_MAKE_OUT     EQU 4D          ; cycle count *100mS
VAC_BREAK_OUT    EQU (255D-4D)
VAC_MAKE_IN      EQU 2D
VAC_BREAK_IN     EQU (255D-2D)

VAC_DEL          EQU 8D
CMD_DEL_EX       EQU 4D
VAC_DEL_EX       EQU 50D

```

---

 PREDEFINED REG
 

---

```

.SP              equ 255          ; stack pointer
.RP              equ 253          ; register pointer
.FLAGS           equ 252          ; cpu flags
.IMR             equ 251          ; interrupt mask reg
.IRQ             equ 250          ; interrupt request
.IPR             equ 249          ; interrupt priority
.P01M           equ 248          ; port 0 mode
.P3M             equ 247          ; port 3 mode
.P2M             equ 246          ; port 2 mode
.PRE0            equ 245          ; prescaler for timer 0
.T0              equ 244          ; timer 0
.PRE1            equ 243          ; prescaler for timer 1
.T1              equ 242          ; timer 1
.TMR             equ 241          ; timer mode
.P3              equ 3            ; port 3

```

~~46~~

```

.P2      equ 2      , port 2
.P0      equ 0      , port 0

ALL_ON_IMR equ 00111101b , turn on int for timers rpm auxobs radio
RETURN_IMR equ 00011101b , return on the IMR

```

---

GLOBAL REGISTERS

---

```

STATUS      .EQU 04H  ; CMD_TEST 00
                ; WL_TEST 01
                ; VAC_TEST 02
                ; CHARGE_03

STATE      EQU 05H  , state register
PWM_STATUS .EQU 06H
PWM_OFF    .EQU 07H
AUTO_DELAY_HI .EQU 08H
AUTO_DELAY_LO .EQU 09H
AUTO_DELAY .EQU 08H
MOTOR_TIMER_HI .EQU 0AH
MOTOR_TIMER_LO .EQU 0BH
MOTOR_TIMER .EQU 0AH
LIGHT_TIMER_HI .EQU 0CH
LIGHT_TIMER_LO .EQU 0DH
LIGHT_TIMER .EQU 0CH

PRE_LIGHT   .EQU 0FH
SW_DATA     .EQU 10H
ONEP2       .EQU 11H
LAST_CMD    .EQU 12H
                ; 1.2 SEC TIMER TICK .125
                ; LAST COMMAND FROM
                ; = 55 WALL CONTROL
                ; = 00 RADIO
                ; B CODE FLAG
                ; 77 = b code
BCODEFLAG   .EQU 13H
                ; RPM PULSE ONE SECOND DISABLE
RPMONES     .EQU 14H
                ; RPM PULSE CLEAR AND TEST TIMER
RPMCLEAR    .EQU 15H
                ; RPM FORCED AREV FLAG
FAREVFLAG   .EQU 16H
                ; 88H FOR A FORCED REVERSE

FLASH_FLAG .EQU 17H
FLASH_DELAY_HI .EQU 18H
FLASH_DELAY_LO .EQU 19H
FLASH_DELAY .EQU 18H
FLASH_COUNTER .EQU 1AH
REASON      EQU 1BH

; 00 COMMAND
; 10 RADIO COMMAND
; 20 FORCE
; 30 AUXOBS
; 40 AUTOREVERSE DELAY TIMEOUT
; 50 LIMIT
; 60 EARLY LIMIT
; 70 MOTOR MAX TIME OUT
; 80 FORCED AREV FROM RPM
; 90 CLOSED WITH COMMAND HELD

```

```

LIGHT_FLAG      EQU 1CH      ; A0   CLOSED WITH THE RADIO HELD
CMD_DEB         EQU 1DH
LIGHT_DEB       EQU 1EH
VAC_DEB         EQU 1FH

```

```

TIMER_GROUP     EQU 20H
sw_address_hi   .equ r0
sw_address_lo   .equ r1
sw_address      .equ rr0
t_address_hi    .equ r2
t_address_lo    .equ r3
t_address       .equ rr2
switch_delay    .equ r4
limit           .equ r5
obs_count       .equ r6
rs232do         .equ r7
rs232di         .equ r8
rscommand       .equ r9
rs232docount    .equ r10
rs232dicount    .equ r11
rs232odelay     .equ r12
rs232ideelay    .equ r13
rs232ccount     .equ r14
rs232page       .equ r15

```

```

SWITCH_DELAY    EQU TIMER_GROUP+4
LIMIT           EQU TIMER_GROUP+5
OBS_COUNT       EQU TIMER_GROUP+6
RS232DO         EQU TIMER_GROUP+7
RS232DI         EQU TIMER_GROUP+8
RSCOMMAND       EQU TIMER_GROUP+9
RS232DOCOUNT    EQU TIMER_GROUP+10
RS232DICOUNT    EQU TIMER_GROUP+11
RS232ODELAY     EQU TIMER_GROUP+12
RS232IDELAY     EQU TIMER_GROUP+13
RS232CCOUNT     EQU TIMER_GROUP+14
RS232PAGE       EQU TIMER_GROUP+15

```

```

.....
LEARN EE GROUP FOR LOOPS ECT
.....

```

```

LEARNEE_GRP     .equ 30H
TEMPH           .equ LEARNEE_GRP
TEMPL           .equ LEARNEE_GRP+1
TEMP            .equ LEARNEE_GRP+2
LEARNDB         .equ LEARNEE_GRP+3 ; learn debouncer
LEARNT          .equ LEARNEE_GRP+4 ; learn timer
ERASET          .equ LEARNEE_GRP+5 ; erase timer
MTEMPH          .equ LEARNEE_GRP+6 ; memory temp
MTEMPL          .equ LEARNEE_GRP+7 ; memory temp
MTEMP           .equ LEARNEE_GRP+8 ; memory temp
SERIAL           .equ LEARNEE_GRP+9 ; serial data to and from nonvol memory
ADDRESS         .equ LEARNEE_GRP+10 ; address for the serial nonvol memory

```

```

T0EXT      .equ    LEARNEE_GRP+11    ; timer 0 extend decremented every T0 int
T4MS       .equ    LEARNEE_GRP+12    ; 4 mS counter
T125MS     .equ    LEARNEE_GRP+13    ; 125mS counter
ZZWIN      .equ    LEARNEE_GRP+14    ; radio 00 code window
SKIPRADIO  .equ    LEARNEE_GRP+15    ; flag to skip the radio read and write if
                                           ; learn or vacation are talking to it

temph      .equ    r0
templ      .equ    r1
temp       .equ    r2
;
learndb    .equ    r3                ; learn debouncer
learnt     .equ    r4                ; learn timer
eraset     .equ    r5                ; erase timer
mtemph     .equ    r6                ; memory temp
mtempl     .equ    r7                ; memory temp
mtemp      .equ    r8                ; memory temp
serial     .equ    r9                ; serial data to and from nonvol memory
address    .equ    r10               ; address for the serial nonvol memory
t0extl     .equ    r11               ; timer 0 extend decremented every T0 int
t4ms       .equ    r12               ; 4 mS counter
t125ms     .equ    r13               ; 125mS counter
zzwin      .equ    r14
;
skipradio  .equ    r15               ; flag to skip the radio read and write if
                                           ; learn or vacation are talking to it

```

```

PWM_GROUP  .EQU    40H
dnforce    .equ    r0
upforce    .equ    r1
up_force_hi .equ    r4
up_force_lo .equ    r5
up_force    .equ    r4
dn_force_hi .equ    r6
dn_force_lo .equ    r7
dn_force    .equ    r6
force_add_hi .equ    r8
force_add_lo .equ    r9
force_add    .equ    r8
up_temp     .equ    r10
dn_temp     .equ    r11
pulsewidth  .equ    r12
pwm_count   .equ    r13

```

```

DNFORCE    .equ    40H
UPFORCE    .equ    41H
AOBSTEST    .equ    42H
FAULTTIME   .equ    43H
UP_FORCE_HI .equ    44H
UP_FORCE_LO .equ    45H
DN_FORCE_HI .equ    46H
DN_FORCE_LO .equ    47H
PULSEWIDTH  .equ    4CH
PWM_COUNT   .equ    4DH
AOBSF       .equ    4EH
FAULTCODE   .equ    4FH

```

```
RPM_GROUP .EQU 50H
```

```
stackreason .equ r0
stackflag .equ r1
rpm_temp_hi .equ r2
rpm_temp_lo .equ r3
rpm_past_hi .equ r4
rpm_past_lo .equ r5
rpm_past .equ r4
rpm_period_hi .equ r6
rpm_period_lo .equ r7
rpm_period .equ r6
rpm_count .equ r8
rpm_diff_hi .equ r9
rpm_diff_lo .equ r10
rpm_2past_hi .equ r11
rpm_2past_lo .equ r12
rpm_set_diff_hi .equ r13
rpm_set_diff_lo .equ r14
rpm_time_out .equ r15
```

```
STACKREASON .EQU RPM_GROUP+0
STACKFLAG .EQU RPM_GROUP+1
RPM_TEMP_HI .EQU RPM_GROUP+2
RPM_TEMP_LO .EQU RPM_GROUP+3
RPM_PAST_HI .EQU RPM_GROUP+4
RPM_PAST_LO .EQU RPM_GROUP+5
RPM_PERIOD_HI .EQU RPM_GROUP+6
RPM_PERIOD_LO .EQU RPM_GROUP+7
RPM_COUNT .EQU RPM_GROUP+8
RPM_DIFF_HI .EQU RPM_GROUP+9
RPM_DIFF_LO .EQU RPM_GROUP+10
RPM_2PAST_HI .EQU RPM_GROUP+11
RPM_2PAST_LO .EQU RPM_GROUP+12
RPM_SET_DIFF_HI .EQU RPM_GROUP+13
RPM_SET_DIFF_LO .EQU RPM_GROUP+14
RPM_TIME_OUT .EQU RPM_GROUP+15
```

```
.....
; RADIO GROUP
;.....
```

```
RADIO_GRP .equ 60H
RTEMP .equ RADIO_GRP ; radio temp storage
RTEMPH .equ RADIO_GRP+1 ; radio temp storage high
RTEMPL .equ RADIO_GRP+2 ; radio temp storage low
RTIMEAH .equ RADIO_GRP+3 ; radio active time high byte
RTIMEAL .equ RADIO_GRP+4 ; radio active time low byte
RTIMEIH .equ RADIO_GRP+5 ; radio inactive time high byte
RTIMEIL .equ RADIO_GRP+6 ; radio inactive time low byte
RTIMEPH .equ RADIO_GRP+7 ; radio past time high byte
RTIMEPL .equ RADIO_GRP+8 ; radio past time low byte
RADIO3H .equ RADIO_GRP+9 ; 3 mS code storage high byte
```



```

RADIO3L      .equ  RADIO_GRP+10      ; 3 mS code storage low byte
RADIO1H      .equ  RADIO_GRP+11      ; 1 mS code storage high byte
RADIO1L      .equ  RADIO_GRP+12      ; 1 mS code storage low byte
RADIOC       .equ  RADIO_GRP+13      ; radio word count
RTIMEDH      .equ  RADIO_GRP+14      ; radio difference of active and inactive
RTIMEDL      .equ  RADIO_GRP+15      ; radio difference
rtemp        .equ  r0                ; radio temp storage
rtemph       .equ  r1                ; radio temp storage high
rtempl       .equ  r2                ; radio temp storage low
rtimeah      .equ  r3                ; radio active time high byte
rtimeal      .equ  r4                ; radio active time low byte
rtimeih      .equ  r5                ; radio inactive time high byte
rtimeil      .equ  r6                ; radio inactive time low byte
rtimeph      .equ  r7                ; radio past time high byte
rtimepl      .equ  r8                ; radio past time low byte
radio3h      .equ  r9                ; 3 mS code storage high byte
radio3l      .equ  r10               ; 3 mS code storage low byte
radio1h      .equ  r11               ; 1 mS code storage high byte
radio1l      .equ  r12               ; 1 mS code storage low byte
radioc       .equ  r13               ; radio word count
rtimedh      .equ  r14               ; radio difference of active and inactive
rtimedl      .equ  r15               ; radio difference

CHECK_GRP    .equ  70H
check_sum    .equ  r0                ; check sum pointer
rom_data     .equ  r1
test_adr_hi  .equ  r2
test_adr_lo  .equ  r3
test_adr     .equ  r2
CHECK_SUM    .equ  CHECK_GRP+0      ; check sum reg for por
ROM_DATA     .equ  CHECK_GRP+1      ; data read
AUXLEARN_SW  .equ  CHECK_GRP+2
RRT0         .equ  CHECK_GRP+3
RPM_ACOUNT  .equ  74H              ; to test for active rpm
RSCCOUNT   .equ  75H              ; rs232 byte counter
RSSTART      .equ  76H              ; rs232 start flag

RADIO_CMD    .equ  77H              ; radio command
R_DEAD_TIME  .equ  78H
FAULT        .equ  79H

VACFLAG      .equ  7AH              ; VACATION mode flag
VACFLASH     .equ  7BH
VACCHANGE    .equ  7CH
TASKSWITCH   .equ  7DH
FORCE_IGNORE .equ  7EH
FORCE_PRE    .equ  7FH
SDISABLE     .equ  80H              ; system disable timer
PRADIO3H     .equ  81H              ; 3 mS code storage high byte
PRADIO3L     .equ  82H              ; 3 mS code storage low byte
PRADIO1H     .equ  83H              ; 1 mS code storage high byte
PRADIO1L     .equ  84H              ; 1 mS code storage low byte
RTO          .equ  85H              ; radio time out
RFLAG        .equ  86H              ; radio flags
RINFILTER     .equ  87H              ; radio input filter

```

```

LIGHT1S      .equ 88H      ; light timer for 1second flash
DOG2         .equ 89H      ; second watchdog
FAULTFLAG    .equ 8BH      ; flag for fault blink stops radio blink
MOTDEL       .equ 8CH      ; motor time delay
LIGHTS       .equ 8DH      ; light state
DELAYC       .equ 8EH      ; for the time delay for command
COUNTER      .equ 8FH      ; delay counter

```

```

BACKUP_GRP    .equ 90H
ForcedDown    .equ BACKUP_GRP
BRPM_COUNT    .equ BACKUP_GRP+1
BRPM_TIME_OUT .equ BACKUP_GRP+2
BFORCE_IGNORE .equ BACKUP_GRP+3
BAUTO_DELAY_HI .equ BACKUP_GRP+4
BAUTO_DELAY_LO .equ BACKUP_GRP+5
BAUTO_DELAY    .equ BACKUP_GRP+4
BCMD_DEB      .equ BACKUP_GRP+6
BSTATE        .equ BACKUP_GRP+7

```

```

STACKTOP     .equ 238      ; start of the stack
STACKEND      .equ 0A0H    ; end of the stack

```

```

.P3          .equ 3        ; port 3
.P2          .equ 2        ; port 2
.P0          .equ 0        ; port 0

RS232OS      .equ 0100000B ; RS232 output bit set
RS232OC      .equ 1011111B ; RS232 output bit clear
RS232OP      .equ P3       ; RS232 output port
RS232IP      .equ P2       ; RS232 input port
RS232IM      .equ 0010000B ; RS232 mask
csh          .equ 0001000B ; chip select high for the 93c46
csl          .equ 1110111B ; chip select low for 93c46
clockh       .equ 0000100B ; clock high for 93c46
clockl       .equ 1111011B ; clock low for 93c46
doh          .equ 0000010B ; data out high for 93c46
dol          .equ 1111101B ; data out low for 93c46
ledh         .equ 1000000B ; turn the led pin high "on"
ledl         .equ 0111111B ; turn the led pin low "off"
psmask       .equ 0100000B ; mask for the program switch
csport       .equ P2       ; chip select port
dioport      .equ P2       ; data i/o port
clkport      .equ P2       ; clock port
ledport      .equ P2       ; led port
psport       .equ P2       ; program switch port

```

```

WATCHDOG_GROUP .EQU 0FH
pcan          .equ r0
smr           .equ r11
wdtmr        .equ r15

```

```

WDT           macro
               .byte 5fh

```

```

        endm
FILL    macro
        byte 0FFh
        endm

```

```

TRAP    .macro
        jp    start
        jp    start
        jp    start
        jp    start
        jp    start
        endm
TRAP10  macro
        TRAP
        TRAP
        TRAP
        TRAP
        TRAP
        TRAP
        TRAP
        TRAP
        TRAP
        TRAP
        endm

```

.....

Interrupt Vector Table

.....

```

.org    0000H

word    RADIO_INT    ;IRQ0
word    000CH         ;IRQ1, P3.3
word    RPM           ;IRQ2, P3.1
.word    AUX_OBS      ;IRQ3, P3.0
word    TIMERUD       ;IRQ4, T0
word    PWM           ;IRQ5, T1

.page
.org    000CH
jp      START        ; start jmps to start at location 0101 or 0202 ect

```

.....

FORCE TABLE

.....

```

force_table_50
F_0:    .word    107FH
F_1:    .word    107FH
F_2:    .word    109DH
F_3:    .word    10BBH
F_4:    .word    10D9H

```

~~4-12~~

---

F_5	word	10F8H
F_6	word	1116H
F_7	word	1134H
F_8	word	1152H
F_9	word	1168H
F_10	word	117DH
F_11	word	1193H
F_12	word	119FH
F_13	word	11ABH
F_14	word	11B7H
F_15	word	11C3H
F_16	word	11CFH
F_17	word	11DFH
F_18	word	11E8H
F_19	word	11F4H
F_20	word	1200H
F_21	word	120CH
F_22	word	1218H
F_23	word	1224H
F_24	word	1230H
F_25	word	123CH
F_26	word	1248H
F_27	word	1254H
F_28	word	1260H
F_29	word	126CH
F_30	word	1278H
F_31	word	1284H
F_32	word	1291H
F_33	word	129DH
F_34	word	12BBH
F_35	word	12D9H
F_36	word	12F7H
F_37	word	1315H
F_38	word	1333H
F_39	word	1352H
F_40	word	1370H
F_41	word	138EH
F_42	word	13ACH
F_43	word	13CAH
F_44	word	1407H
F_45	word	1443H
F_46	word	147FH
F_47	word	14BCH
F_48	word	14F8H
F_49	word	1534H
F_50	word	1571H
F_51	word	15E9H
F_52	word	1626H
F_53	word	169EH
F_54	word	1717H
F_55	word	17D5H
F_56	word	1951H
F_57	word	1B8DH
F_58	word	1E86H
F_59	word	223EH
F_60	word	26B4H

```

F_61      word      2BE9H
F_62      .word     31DDH
F_63      .word     388EH
F_64      .word     388EH

```

---

### RS232 DATA ROUTINES

---

enter rs232 start with word to output in rs232do

#### RS232OSTART:

```

push      rp          ; save the rp
srp       #TIMER_GROUP ; set the group pointer
clr       RSSTART     ; one shot
ld        rs232delay,#6d ; set the time delay to 3 mS
clr       rs232dcount  ; start with the counter at 0
and       RS232OP,#RS232OC ; clear the output
jr        NORSOUT

```

#### RS232.

```

cp        RSSTART,#0FFH ; test for the start flag
jr        z,RS232OSTART

```

#### RS232OUTPUT.

```

push      rp          ; save the rp
srp       #TIMER_GROUP ; set the group pointer
cp        rs232dcount,#11d ; test for last
jr        nz,RS232R
or        RS232OP,#RS232OS ; set the output idle
jr        NORSOUT

```

#### RS232R

```

djnz     rs232delay,NORSOUT ; cycle count time delay
inc      rs232dcount        ; set the count for the next cycle
scf      ; set the carry flag for stop bits
rrc      rs232do            ; get the data into the carry
jr        c,RS232SET        ; if the bit is high then set
and      RS232OP,#RS232OC   ; clear the output
jr        SETTIME           ; find the delay time

```

#### RS232SET

```

or        RS232OP,#RS232OS ; set the output

```

#### SETTIME.

```

ld        rs232delay,#6d ; set the data output delay
tm        rs232dcount,#00000001b ; test for odd words
jr        z,NORSOUT      ; if even done
ld        rs232delay,#7d ; set the delay to 7 for odd
; this gives 6.5 * .512mS

```

#### NORSOUT.

#### RS232INPUT:

```

cp        rs232dcount,#0FFH ; test mode
jr        nz,RECEIVING      ; if receiving then jump
tm        RS232IP,#RS232IM  ; test the incoming data
jr        nz,NORSIN         ; if the line is still idle then skip
clr       rs232dcount       ; start at 0
ld        rs232delay,#3     ; set the delay to mid

```

## RECEIVING

```

dlnz rs232delay,NORSIN      ; skip till delay is up
inc  rs232dicount           ; bit counter
cp   rs232dicount,#10d      ; test for last timeout
jr   z,DIEVEN
tm   RS232IP,#RS232IM       ; test the incoming data
rcf                                     ; clear the carry
jr   z,SKIPSETTING          ; if input bit not set skip setting carry
scf                                     ; set the carry

```

## SKIPSETTING

```

rrc  rs232di                ; save the data into the memory
ld   rs232delay,#6d         ; set the delay
tm   rs232dicount,#00000001b ; test for odd
jr   z,NORSIN               ; if even skip
ld   rs232delay,#7          ; set the delay
jr   NORSIN

```

## DIEVEN

```

ld   rs232dicount,#0FFH     ; turn off the input till next start
ld   rscommand,rs232di      ; save the value
clr  RSCCOUNT              ; clear the counter

```

## NORSIN

```

pop  rp                    ; return the rp
ret
FILL
FILL

```

.....

REGISTER INITIALIZATION

.....

```

start      org  0101H        ; address has both bytes the same
START      di   RP,#WATCHDOG_GROUP ; turn off the interrupt for init
           ld   wdtmr,#00001111B ; rc dog 100mS
           WDT                                     ; kick the dog
           clr  RP            ; clear the register pointer

```

.....

PORT INITIALIZATION

.....

```

ld   P0,#P01S_INIT          ; RESET all ports
ld   P2,#P2S_INIT-2         ; Set the up limit high , down limit low
ld   P3,#P3S_INIT           ;
ld   P01M,#P01M_INIT        ; set mode p00-p03 out p04-p07in
ld   P3M,#P3M_INIT          ; set port3 p30-p33 input analog mode
                                   ; p34-p37 outputs
ld   P2M,#(P2M_INIT-3)      ; set port 2 mode setting the limits as
                                   ; outputs for fema of open

```

.....

Internal RAM Test and Reset All RAM = mS

.....

```

        srp    #0F0h           ; point to control group use stack
        ld     r15,#4          ; r15= pointer (minimum of RAM)

write_again:
        WDT
        ld     r14,#1          ; KICK THE DOG

write_again1:
        ld     @r15,r14        ; write 1,2,4,8,10,20,40,80
        cp     r14,@r15        ; then compare
        jr     ne,system_error
        rl     r14
        jr     nc,write_again1
        clr    @r15            ; write RAM(r5)=0 to memory
        inc    r15
        cp     r15,#240
        jr     ult,write_again

```

```

.....
Checksum Test
.....
CHECKSUMTEST
        srp    #CHECK_GRP
        ld     test_adr_hi,#0FH
        ld     test_adr_lo,#0FFH      ; maximum address=fffh

add_sum:
        WDT                          ; KICK THE DOG
        ldc    rom_data,@test_adr     ; read ROM code one by one
        add    check_sum,rom_data     ; add it to checksum register
        decw   test_adr               ; increment ROM address
        jr     nz,add_sum             ; address=0 ?
        cp     check_sum,#check_sum_value
        jr     z,system_ok            ; check final checksum = 00 ?

system_error:
        and    ledport,#ledl          ; turn on the LED to indicate fault
        jr     system_error

        .byte  256-check_sum_value

system_ok:
        WDT                          ; kick the dog

        ld     STACKEND,#STACKTOP     ; start at the top of the stack
SETSTACKLOOP:
        ld     @STACKEND,#01H         ; set the value for the stack vector
        dec    STACKEND               ; next address
        cp     STACKEND,#STACKEND     ; test for the last address
        jr     nz,SETSTACKLOOP        ; loop till done

CLEARDONE:
        ld     STATE,#06d             ; set the state to stop
        ld     BSTATE,#06d
        ld     STATUS,#CHARGE         ; set start to charge

```



```

ld SWITCH_DELAY,#CMD_DEL_EX ; set the delay time to cmd
ld LIGHT_TIMER_HI,#SET_TIME_HI ; set the light period
ld LIGHT_TIMER_LO,#SET_TIME_LO ; for the 4.5 min timer
ld PRE_LIGHT,#SET_TIME_PRE ;
ld PULSEWIDTH,#MIN_COUNT ; set init
ld PWM_COUNT,#TOTAL_PWM_COUNT;
ld RPMONES,#244d ; set the hold off
ld RS232DOCOUNT,#11D ; turn off the rs232 output
srp #LEARNER_GRP
ld leamdb,#0FFH ; set the learn debouncer
ld zzwin,leamdb ; turn off the learning
ld CMD_DEB,leamdb ; in case of shorted switches
ld BCMD_DEB,leamdb - ; in case of shorted switches
ld VAC_DEB,leamdb ;
ld LIGHT_DEB,leamdb ;
ld ERASET,leamdb ; set the erase timer
ld learnt,leamdb ; set the learn timer
ld RTO,leamdb ; set the radio time out
ld AUXLEARNSW,leamdb ; turn off the aux learn switch
ld RRTO,leamdb ; set the radio timer

```

#### STACK INITIALIZATION

```

clr 254
ld 255,#238D ; set the start of the stack

```

#### TIMER INITIALIZATION

```

ld PRE0,#00001001B ; set the prescaler to / 2 for 8Mhz
ld PRE1,#01000010B ; one shot mode /16
ld T0,#000H ; set the counter to count FF through 0
ld T1,MIN_COUNT ; set init count
ld TMR,#00000011B ; turn on the timer

```

#### PORT INITIALIZATION

```

ld P0,#P01S_INIT ; RESET all ports
ld P2,#P2S_INIT ;
ld P3,#P3S_INIT ;
ld P01M,#P01M_INIT ; set mode p00-p03 out p04-p07in
ld P3M,#P3M_INIT ; set port3 p30-p33 input analog mode
; p34-p37 outputs
ld P2M,#(P2M_INIT+0) ; set port 2 mode

```

#### READ THE MEMORY 2X AND GET THE VACFLAG

```

ld SKIPRADIO,#0FFH ;
ld ADDRESS,#1EH ; set non vol address to the VAC flag

```

*Ante*



```

call    READMEMORY      ; read the value 2X 1X INIT 2ND read
call    READMEMORY      ; read the value
ld      VACFLAG,MTEMPH  ; save into volital
clr     SKIPRADIO

```

.....  
 INTERRUPT INITIALIZATION  
 .....

SETINTERRUPTS

```

ld      IPR,#00011010B  ; set the priority to timer
ld      IMR,#ALL_ON_IMR ; turn on the interrupt
ld      IRQ,#01000000B  ; set the edge clear int
ei      ; enable interrupt

```

.....  
 RESET SYSTEM REG  
 .....

```

ld      RP,#WATCHDOG_GROUP
ld      smr,#00100010B  ; reset the xtal / number
ld      pcon,#01111110B ; reset the pcon no comparator output
                                ; no low emi mode
ld      PRE0,#0001001B  ; set the prescaler to / 2 for 8Mhz
ld      RS232DO,#0BBH   ; set the rs232 data
jp      VACSWOPEN       ; start the transmission

```

.....  
 MAIN LOOP  
 .....

MAINLOOP.

```

clr     DOG2             ; clear the second watchdog
ld      P01M,#P01M_INIT  ; set mode p00-p03 out p04-p07in
ld      P3M,#P3M_INIT    ; set port3 p30-p33 input analog mode
                                ; p34-p37 outputs
ld      P2M,#(P2M_INIT+0) ; set port 2 mode
cp      VACCHANGE,#0AAH   ; test for the vacation change flag
jr      nz,NOVACCHG       ; if no change the skip
cp      VACFLAG,#0FFH     ; test for in vacation
jr      z,MCLEARVAC       ; if in vac clear
ld      VACFLAG,#0FFH     ; set vacation
jr      SETVACCHANGE      ; set the change
MCLEARVAC.
clr     VACFLAG           ; clear vacation mode
SETVACCHANGE
clr     VACCHANGE         ; one shot
ld      SKIPRADIO,#0FFH   ; set skip flag
ld      ADDRESS,#1EH      ; set the non vol address to the VAC flag
ld      MTEMPH,VACFLAG    ; store the vacation flag
ld      MTEMPL,VACFLAG    ;
call    WRITEMEMORY       ; write the value
clr     SKIPRADIO         ; clear skip flag
NOVACCHG.

```

```

cp      STACKFLAG,#0FFH      ; test for the change flag
jr      nz,NOCHANGEST        ; if no change skip updating

srp     #LEARNER_GRP         ; set the register pointer
clr     STACKFLAG            ; clear the flag
ld      SKIPRADIO,#0FFH      ; set skip flag
ld      address,#1CH         ; set the non voi address to the cycle c
call    READMEMORY           ; read the value
inc     mtempl               ; increase the counter lower byte
jr      nz,COUNTER1DONE      ;
inc     mtemph               ; increase the counter high byte
jr      nz,COUNTER2DONE      ;
call    WRITEMEMORY          ; store the value
inc     address              ; get the next bytes
call    READMEMORY           ; read the data
inc     mtempl               ; increase the counter low byte
jr      nz,COUNTER2DONE      ;
inc     mtemph               ; increase the vountner high byte
COUNTER2DONE:
call    WRITEMEMORY          ; save the value
ld      address,#1CH         ;
call    READMEMORY           ; read the data

and     mtemph,#00001111B    ; find the force address
or      mtemph,#30H          ;
ld      ADDRESS,MTEMPH       ; set the address
ld      mtempl,DNFORCE       ; read the forces
ld      mtemph,UPFORCE       ;
call    WRITEMEMORY          ; write the value
jr      CDONE                ; done set the back trace
COUNTER1DONE:
call    WRITEMEMORY          ; got the new address
CDONE:
ld      address,#1CH         ; get the first byte
call    READMEMORY           ;
and     mtempl,#00001111b    ; find the address
ld      address,#20H         ;
add     address,mtempl       ;
ld      mtemph,STACKREASON   ;
or      mtemph,STATE         ; or in the state
call    WRITEMEMORY          ; write the value to stack
clr     SKIPRADIO            ; clear skip flag

NOCHANGEST:
call    LEARN                ; do the learn switch
di
cp      BRPM_COUNT,RPM_COUNT
jr      z,TESTRPM

RESET:
jp      START

TESTRPM:
cp      BRPM_TIME_OUT,RPM1_TIME_OUT
jr      nz,RESET
cp      BFORCE_IGNORE,FORCE_IGNORE
jr      nz,RESET
ei

```

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```

di
cp    BAUTO_DELAY_HI,AUTO_DELAY_HI
jr    nz,RESET
cp    BAUTO_DELAY_LO,AUTO_DELAY_LO
jr    nz,RESET
cp    BCMD_DEB,CMD_DEB
jr    nz,RESET
cp    BSTATE,STATE
jr    nz,RESET
ei

TESTRS232.
cp    RSSTART,#0FFH          ; test for starting a transmission
jr    z,skips232             ; if starting a trans skip
cp    RSCOMMAND,#0FFH        ; test for the off mode
jr    z,skips232
cp    RS232DOCOUNT,#11d      ; test for output done
jr    nz,skips232            ; if not the skip
cp    RSCOMMAND,#30H         ; test for switch data
jr    nz,TEST31
clr    RS232DO               ; clear the data

tm    p2,#UP_LIMIT           ; test for up limit
jr    nz,UPLIMOPEN
or    RS232DO,#00000001B     ; set the marking bit

UPLIMOPEN.
tm    p2,#DN_LIMIT           ; test for the down limit
jr    nz,DNLIMOPEN
or    RS232DO,#00000010B     ; set the marking bit

DNLIMOPEN.
cp    CMD_DEB,#0FFH          ; test for the command set
jr    nz,CMDSWOPEN
or    RS232DO,#00000100B     ; set the marking bit

CMDSWOPEN
cp    LIGHT_DEB,#0FFH        ; test for the worklight set
jr    nz,WLSWOPEN
or    RS232DO,#00001000B     ; set the marking bit

WLSWOPEN
cp    VAC_DEB,#0FFH          ; test fir the vacation set
jr    nz,VACSWOPEN
or    RS232DO,#00010000B     ; set the marking bit

VACSWOPEN
dec    RSSTART               ; set the start flag
ld     RSCOMMAND,#0FFH       ; turn off command
; return

skips232:
jp     SKIPRS232

TEST31.
cp    RSCOMMAND,#31H         ; test for status data
jr    nz,TEST32
ld     RS232DO,STATE         ; read the state
cp    LEARNT,#0FFH           ; test for learn mode
jr    z,NOTINLEARN
or    RS232DO,#00010000B
;

NOTINLEARN.
cp    VACFLAG,#00H           ; test the vacation flag

```

```

jr      z,NOTINVACATION
or      RS232DO,#00100000B

NOTINVACATION.
tm      p0,WORKLIGHT      ; test for the light on
jr      z,LIGHTISOFF
or      RS232DO,#01000000B ; mark the bit

LIGHTISOFF.
tm      AOBSE,#00000001B   ; test for aobs error
jr      z,AOBSFINE
or      RS232DO,#10000000B

AOBSFINE.
jr      VACSWOPEN

TEST32
cp      RSCOMMAND,#32H     ; test for rpm data
jr      nz,TEST33
ld      RS232DO,RPM_PERIOD_LO ;
cp      RSCCOUNT,#01H    ; test for on transmitted last cycle
jr      z,LASTRPM
ld      RS232DO,RPM_PERIOD_HI ;

STARTOUT.
dec     RSSTART            ; set the start flag
inc     RSCCOUNT          ; increase the count
jr      skiprs232          ; return
LASTRPM clr     RSCCOUNT   ; reset the counter
jp      VACSWOPEN          ; return

TEST33
cp      RSCOMMAND,#33H     ; test for force data
jr      nz,TEST34
ld      RS232DO,UPFORCE    ;
cp      RSCCOUNT,#00     ; test for the first byte
jr      z,STARTOUT         ; output
ld      RS232DO,DNFORCE    ;
jr      LASTRPM            ; output

TEST34
cp      RSCOMMAND,#34H     ; test for radio page
jr      nz,TEST35
ld      RS232PAGE,#00H    ;
jr      RS232PAGEOUT

TEST35.
cp      RSCOMMAND,#35H     ; test for force page data
jr      nz,TEST36
ld      RS232PAGE,#10H    ;
jr      RS232PAGEOUT

TEST36.
cp      RSCOMMAND,#36H     ; test for history page 1 data
jr      nz,TEST37
ld      RS232PAGE,#20H    ;
jr      RS232PAGEOUT

TEST37.
cp      RSCOMMAND,#37H     ; test for history page 2 data
jr      nz,TEST38

```

```

ld      RS232PAGE,#30H

RS232PAGEOUT
ld      SKIPRADIO,#0FFH      ; set the skip radio flag
ld      ADDRESS,RSCCOUNT   ; find the address
rcf
rrc      ADDRESS
or      ADDRESS,RS232PAGE
call    READMEMORY          ; read the data
ld      RS232DO,MTEMPH
tm      RSCCOUNT,#01H      ; test which byte
jr      z,RPBYTE
ld      RS232DO,MTEMPL

RPBYTE
clr      SKIPRADIO          ; turn off the skip radio
cp      RSCCOUNT,#1FH      ; test for the end
jp      z,LASTRPM
jp      STARTOUT

TEST38.
cp      RSCCOMMAND,#38H      ; test memory
jr      nz,TEST39
ld      RS232DO,#0FFH        ; flag set to error to start
ld      SKIPRADIO,#0FFH      ; set the skip radio flag
ld      MTEMPH,#0FFH         ; set the data to write
ld      MTEMPL,#0FFH
ld      ADDRESS,#00          ; start at address 00

WRITELOOP1
WDT
call    WRITEMEMORY
inc      ADDRESS             ; do the next address
cp      ADDRESS,#40H         ; test for the last address
jr      nz,WRITELOOP1
ld      ADDRESS,#00          ; start at address 0

READLOOP1.
WDT
call    READMEMORY          ; read the data
inc      MTEMPH              ; test the high
jr      nz,MEMORYERROR       ; if error mark
inc      MTEMPL              ; test the low
jr      nz,MEMORYERROR       ; if error mark
inc      ADDRESS             ; set the next address
cp      ADDRESS,#40H         ; test for the last address
jr      nz,READLOOP1

ld      MTEMPH,#000H          ; set the data to write
ld      MTEMPL,#000H
ld      ADDRESS,#00          ; start at address 00

WRITELOOP2
WDT
call    WRITEMEMORY
inc      ADDRESS             ; do the next address
cp      ADDRESS,#40H         ; test for the last address
jr      nz,WRITELOOP2
ld      ADDRESS,#00          ; start at address 0

READLOOP2.

```

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```

WDT
call READMEMORY          ; read the data
cp MTEMPH #00            ; test the high
jr nz, MEMORYERROR       ; if error mark
cp MTEMPL #00            ; test the low
jr nz, MEMORYERROR       ; if error mark
inc ADDRESS              ; set the next address
cp ADDRESS, #40H          ; test for the last address
jr nz, READLOOP2
call CLEARCODES
clr SKIPRADIO             ; clear the skip radio flag
clr RS232DO               ; flag all ok
MEMORYERROR
jp VACSWOPEN
TEST39
cp RSCOMMAND, #39H        ; test memory
jr nz, SKIPRS232
ld RSCOMMAND, #0FFH       ; turn off command
call SETLEARN
SKIPRS232
cp R_DEAD_TIME, #20       ; test for too long dead
jp nz, MAINLOOP           ; if not loop
clr RADIOC               ; clear the radio counter
clr RFLAG                 ; clear the radio flag
jp MAINLOOP               ; loop forever

.....
; Radio interrupt from a edge of the radio signal
.....

RADIO_INT
push RP                   ; save the radio pair
srp #RADIO_GRP           ; set the register pointer

ld rtemp, T0EXT           ; read the upper byte
ld rtempl, T0             ; read the lower byte
tm IRQ, #00010000B        ; test for pending int
jr z, RTIMEOK             ; if not then ok time
tm rtempl, #10^000000B    ; test for timer reload
jr z, RTIMEOK             ; if not reloaded then ok
dec rtemp                 ; if reloaded then dec high for sync

RTIMEOK
clr R_DEAD_TIME           ; clear the dead time
and IMR, #11111110B       ; turn off the radio interrupt
ld rtimeh, rtemp           ; find the difference
ld rtimel, rtempl
sub rtimel, rtemp
sbc rtimeh, rtemp          ; in the past time and the past time in temp
tm rtimeh, #100000000B    ; test for a negative number
jr z, RTIMEDONE           ; if the number is not negative then done
ld rtimeh, rtemp           ; find the difference
ld rtimel, rtempl

```

```

sub    rtimepl rtimepl      ;
sbc    rtimeh,rtimeph      ; in the past time and the past time in temp
RTIMEDONE:
tm     P3.#00000100B      ; test the port for the edge
jr     nz,ACTIVETIME      ; if it was the active time then branch
INACTIVETIME
cp     RINFILTER,#0FFH    ; test for active last time
jr     z,GOINACTIVE       ; if so continue
jr     RADIO_EXIT        ; if not the return
GOINACTIVE
or     IRQ.#01000000B     ; set the bit setting direction to pos edge
clr    RINFILTER          ; set flag to inactive
ld     rtimeh,rtimeh      ;
ld     rtimei,rtimei      ;
ld     rtimeph,rtimeph    ; transfer temp into the past
ld     rtimepl,rtimepl    ;
jr     RADIO_EXIT        ; return
ACTIVETIME
cp     RINFILTER,#00H     ; test for active last time
jr     z,GOACTIVE        ; if so continue
jr     RADIO_EXIT        ; if not the return
GOACTIVE
and    IRQ.#00111111B    ; clear the bit setting direction to neg edge
ld     RINFILTER,#0FFH    ;
ld     rtimeah,rtimeh     ; transfer difference to active
ld     rtimeal,rtimeal    ;
ld     rtimeph,rtimeph    ; transfer temp into the past
ld     rtimepl,rtimepl    ;
ei
cp     radioc,#00H        ; test for blank time
jr     nz,INSIGNAL       ; if the count is not zero then we are in signal
MEASUREBLANK
cp     rtimeh,#110D       ; test the timer for > 55mS
jp     ugt,CLEARRRADIO   ; if > 55 then clear the radio
cp     rtimeh,#40D       ; test the timer for < 20mS
jp     ult,CLEARRRADIO   ; if < 20mS then clear the radio
cp     rtimeah,#03H       ; test the sync pulse for a 3mS period first > 1
jr     ugt,SETREC3MS     ; if 2mS or greater then 3mS sync code
jr     nz,SETREC1MS      ; if less then 1 then it is a 1mS sync code
cp     rtimeal,#09DH      ; test for 1.85 "middle value 2"
jr     ugt,SETREC3MS     ; if greater then set a 3
SETREC1MS
tm     RFLAG.#00010000B   ; test for the reception of the 1mS code
jr     z,SETFIRST1MS     ; if the bit is not set then this is the first 1mS
and    RFLAG.#10111111B   ; clear the flag so writing into 3mS word
or     RFLAG.#00100000B   ; set the flag saying 2nd 1mS word
clr    radio3h            ; clear the last reception
clr    radio3l            ;
jr     INCCOUNT           ; then inc the count for insignal
SETFIRST1MS
or     RFLAG.#01000000B   ; set the flag for the first 1mS word
clr    radio1h            ; clear the last reception
clr    radio1l            ;
jr     INCCOUNT           ; then inc the count for insignal
SETREC3MS
and    RFLAG.#10111111B   ; clear the flag so writing into 3mS word

```

```

                                clr    radio3h      ; clear the last reception
                                clr    radio3l
INCCOUNT                       inc    radioc        ; set the counter to the next word
                                jr      RADIO_EXIT
RADIO_EXIT:                    pop     RP           ; reset the register pair
                                rret
INSIGNAL
PULSEWOK                       cp      rtimeah,#9D   ; test the radio pulse width for 4.5mS
                                jp      ugt,CLEARRADIO ; if greater then 4.5 then clear the radio
BLANKWOK                       cp      rtimeih,#9D   ; test the radio blank width for 4.5mS
                                jp      ugt,CLEARRADIO ; if greater then 4.5 then clear the radio
                                ld      rtemp,rtimeih ; transfer pulse time to temp reg
                                ld      rtemp,rtimeil ;
                                sub     rtemp,rtimeal ; subtract the pulse from the blank
                                sbc     rtemp,rtimeah ;
                                jr      c,NEGDIFF     ; if the difference is negative then branch
                                cp      rtemp,#01H    ; test for a number 1
                                jr      ugt,SETTO0    ; if greater then set 0
                                jr      ult,SETTO1    ; if less then 1 set to 1
                                tm      rtemp,#10000000B ; test for 80 or greater
                                jr      z,SETTO1      ; if the diff is less then 80h
                                jr      SETTO0        ; else set to a zero
NEGDIFF                        ld      rtemp,rtimeah ; transfer pulse time to temp reg
                                ld      rtemp,rtimeal ;
                                sub     rtemp,rtimeil ; subtract the pulse from the blank
                                sbc     rtemp,rtimeih ;
                                cp      rtemp,#01H    ; test for a number 1
                                jr      ugt,SETTO2    ; if greater then set 2
                                jr      ult,SETTO1    ; if less then 1 set to 1
                                tm      rtemp,#10000000B ; test for 80 or greater
                                jr      z,SETTO1      ; if the diff is less then 80h one
                                jr      SETTO2        ; else set to a two
SETTO0                         ld      RTEMP,#00D    ; set the bit value to a 00
                                jr      INCRECORD     ; goto adding into the record
SETTO1                         ld      RTEMP,#01D    ; set the bit value to a 01
                                jr      INCRECORD     ; goto adding into the record
SETTO2                         ld      RTEMP,#02D    ; set the bit value to a 10
                                jr      INCRECORD     ; goto adding into the record
INCRECORD:                     tm      RFLAG,#01000000B ; test the radio flag for the area to be modifying
                                jr      z,MS3RECORD   ; if the bit is cleared then working the 3ms
                                ld      rtemp,radio1h ; transfer the record to temp
                                ld      rtemp,radio1l ;
                                add     radio1l,rtemp ; add the number to it self 2* for for base 3
                                adc     radio1h,rtemp ;
                                add     radio1l,rtemp ;

```



```

        adc    radio1h,rtemp
        add    radio1l,rtemp
        adc    radio1h,#00h
        inc    radioc          ; increase the radio counter
        cp     radioc,#11D     ; test for the last bit
        jr     z,GOTAWORD      ; if so we got a word
        jp     ugt,CLEARRRADIO ; else garbage
        jr     RADIO_EXIT      ; else return till the next bit comes along

MS3RECORD
        ld     rtemp,radio3h    ; transfer the record to temp
        ld     rtempl,radio3l
        add    radio3l,rtempl   ; add the number to it self 2* for for base 3
        adc    radio3h,rtemp
        add    radio3l,rtempl
        adc    radio3h,rtemp
        add    radio3l,rtemp    ; add in the new value
        adc    radio3h,#00D
        inc    radioc          ; increase the radio counter
        cp     radioc,#11D     ; test for the last bit
        jr     z,GOTAWORD      ; if so we got a word
        jp     RADIO_EXIT      ; else return till the next bit comes along

GOTAWORD
        tm     RFLAG,#01000000B ; test the radio flag for the area we just modifying
        jr     z,MARK3REC       ; if the bit is cleared then the 3ms is filled
        or     RFLAG,#00010000B ; set the flag
        jr     TESTFORTWO       ; jump to test for two codes

MARK3REC
        or     RFLAG,#00001000B ; set the flag
        jr     TESTFORTWO       ; jump to test for two codes

DONEONE
        clr    radioc          ; clear the radio counter
        jp     RADIO_EXIT      ; return

TESTFORTWO
        tm     RFLAG,#00010000B ; test for the 1mS word
        jr     z,DONEONE        ; we just have one code done
        tm     RFLAG,#00001000B ; test for the 3mS word
        jr     z,DONEONE        ; we just have one code done
        tm     RFLAG,#00100000B ; test the flag for BC
        jr     z,KNOWCODE       ; if A code we do nothing
        or     RFLAG,#00000010B ; set the B and C flag
        cp     rtemp,#00        ; test word 10 for a 0 "C" code
        jp     z,KNOWCODE       ; if a C code were done
        or     RFLAG,#00000100B ; set the B code flag

brec
        cp     ZZWIN,#64D       ; test for 8 seconds from known B code
        jr     ugt,KNOWCODE     ; if not skip test
        cp     STATE,#6         ; test for the stopped state
        jr     z,timezzwin      ; if stopped test zzwin
        cp     STATE,#5         ; test for the down limit
        jr     z,timezzwin      ; if at the down limit
        cp     STATE,#2         ; test for at up limit
        jr     z,timezzwin      ; if at the limit jump
        jr     KNOWCODE         ; else no way

timezzwin

```

```

        cp    radio3h,#90H      ; test for the 00 code
        jr    nz,KNOWCODE
        cp    radio3l,#29H      ; test for the 00 code
        jr    nz,KNOWCODE
;SETFB
        push  RP
        srp
        call SETLEARN
        pop  RP
        jp    CLEARRADIO
KNOWCODE
        clr   RRT0              ; clear the got a radio flag
        cp    SKIPRADIO,#0FFH   ; test for the skip flag
        jp    z,CLEARRADIO      ; if skip flag is active then donot look at EE mem

        ld    ADDRESS,#1EH      ; set the non vol address to the VAC flag
        call  READMEMORY        ; read the value
        ld    VACFLAG,MTEMPH    ; save into volital
        cp    LEARN#,#0FFH      ; test for in learn mode
        jr    z,TESTCODE        ; if out of learn mode then test for matching
STORECODE
        cp    PRADIO1H,radio1h   ; test for the match
        jr    nz,STORENOTMATCH   ; if not a match then loop again
        cp    PRADIO1L,radio1l   ; test for the match
        jr    nz,STORENOTMATCH   ; if not a match then loop again
        cp    PRADIO3H,radio3h   ; test for the match
        jr    nz,STORENOTMATCH   ; if not a match then loop again
        cp    PRADIO3L,radio3l   ; test for the match
        jr    nz,STORENOTMATCH   ; if not a match then loop again
        call  TESTCODES          ; test the code to see if in memory now
        cp    ADDRESS,#0FFH      ;
        jr    nz,NOWRITESTORE    ; if there is a match pretend to store
STOREMATCH
        tm    RFLAG,#00000100B   ; test for the b code
        jr    nz,BCODE           ; if a B code jump
        tm    RFLAG,#00000010B   ; test for a C code
        jr    nz,CCODE           ; if a C code jump
ACODE
        ld    ADDRESS,#1FH      ; set the address to read the last written
        call  READMEMORY        ; read the memory
        inc   MTEMPH            ; add 2 to the last written
        inc   MTEMPH            ;
        and   MTEMPH,#11111110B ; set the address on a even number
        cp    MTEMPH,#17H       ; test for the last address
        jr    ul,GOTAADDRESS    ; if not the last address jump
        ld    MTEMPH,#00D       ; set the address to 0
GOTAADDRESS
        ld    ADDRESS,#1FH      ; set the address to write the last written
        ld    RTEMP,MTEMPH      ; save the address
        LD    MTEMPL,MTEMPH     ; both bytes same
        call  WRITEMEMORY       ; write it
        ld    ADDRESS,rtemp     ; set the address
        jr    READYTOWRITE
BCODE
        cp    radio3h,#90H      ; test for the 00 code

```

```

        jr      nz,BCODEOK
        cp      radio3l,#29H      ; test for the 00 code
        jr      nz,BCODEOK
        jp      CLEARRRADIO      ; SKIP MAGIC NUMBER
BCODEOK:
        ld      ADDRESS,#18H      ; set the address for the B code
        jr      READYTOWRITE
CCODE
        ld      ADDRESS,#1AH      ; set the address for the C code
READYTOWRITE
        call    WRITECODE         ; write the code in radio1 and radio3
NOWRITESTORE
        xor     p0,#WORKLIGHT     ; toggle light
        or      ledport,#ledh     ; turn off the LED for program mode
        ld      LIGHT1S,#244D     ; turn on the 1 second blink
        ld      LEARNRT,#0FFH     ; set learnmode timer
        clr     RTO               ; disallow cmd from learn
        jp      CLEARRRADIO       ; return
STORENOTMATCH:
        ld      PRADIO1H,radio1h  ; transfer radio into past
        ld      PRADIO1L,radio1l
        ld      PRADIO3H,radio3h
        ld      PRADIO3L,radio3l
        jp      CLEARRRADIO       ; get the next code

TESTCODE
        cp      FAULTFLAG,#0FFH   ; test for a active fault
        jr      z,FS1             ; if a active fault skip led set and reset
        and     ledport,#ledl     ; turn on the LED for flashing from signal
FS1
        call    TESTCODES         ; test the codes
        cp      FAULTFLAG,#0FFH   ; test for a active fault
        jr      z,FS2             ; if a active fault skip led set and reset
        or      ledport,#ledh     ; turn off the LED for flashing from signal
FS2
        cp      ADDRESS,#0FFH     ; test for the not matching state
        jr      nz,GOTMATCH       ; if matching the send a command if needed
        jp      CLEARRRADIO       ; else clear the radio
GOTMATCH:
        or      RFLAG,#00000001B  ; set the flag for recieving without error
        cp      RTO,#101D         ; test for the timer time out
        jr      ult,NOTNEWMATCH   ; if the timer is active then donot reissue cmd
TESTVAC.
        cp      VACFLAG,#00B      ; test for the vacation mode
        jr      z,TSTSDISABLE     ; if not in vacation mode test the system disable

        cp      ADDRESS,#19H      ; test for the B code
        jr      nz,NOTNEWMATCH    ; if not a B not a match
TSTSDISABLE
        cp      SDISABLE,#32D     ; test for 4 second
        jr      ult,NOTNEWMATCH   ; if 6 s not up not a new code
        clr     RTO               ; clear the radio timeout
        cp      ONEP2,#00         ; test for the 1.2 second time out
        jr      nz,NOTNEWMATCH    ; if the timer is active then skip the command

```

```

RADIOCOMMAND
    clr    RTO                ; clear the radio timeout
    cp     ADDRESS,#19H       ; test for a B code
    jr     nz,BDONTSET        ; if not a b code donot set flag

zzwinclr.
    clr    ZZWIN              ; flag got matching B code

BDONTSET
    ld     BCODEFLAG,#077H    ; flag for aobs bypass

    clr    LAST_CMD           ; mark the last command as radio
    ld     RADIO_CMD,#0AAH    ; set the radio command
    jr     CLEARRADIO         ; return

TESTCODES
    clr    ADDRESS            ; start address is 0

NEXTCODE.
    call   READMEMORY         ; read the word at this address
    cp     MTEMPH,radio1h     ; test for the match
    jr     nz,NOMATCH         ; if not matching then do next address
    cp     MTEMPL,radio1l     ; test for the match
    jr     nz,NOMATCH         ; if not matching then do next address
    inc    ADDRESS            ; set the second half of the code
    call   READMEMORY         ; read the word at this address
    cp     MTEMPH,radio3h     ; test for the match
    jr     nz,NOMATCH2        ; if not matching then do the next address
    cp     MEMPL,radio3l     ; test for the match
    jr     nz,NOMATCH2        ; if not matching then do the next address
    ret                       ; return with the address of the match

NOMATCH:
    inc    ADDRESS            ; set the address to the next code

NOMATCH2
    inc    ADDRESS            ; set the address to the next code
    cp     ADDRESS,#1CH       ; test for the last address
    jr     ut,NEXTCODE        ; if not the last address then try again

GOTNOMATCH
    ld     ADDRESS,#0FFH      ; set the no match flag
    ret                       ; and return

NOTNEWMATCH:
    clr    RTO                ; reset the radio time out
    and    RFLAG,#00000001B   ; clear radio flags leaving recieving w/o error
    clr    radioc              ; clear the radio bit counter
    ld     LEARNT,#0FFH       ; set the learn timer "turn off" and backup
    jp     RADIO_EXIT         ; return

CLEARRADIO.
    and    IRQ,#00111111B     ; clear the bit setting direction to neg edge
    ld     RINFILTER,#0FFH    ; set flag to active

CLEARRADIOA
    tm     RFLAG,#00000001B   ; test for receiving without error
    jr     z,SKIPRTO          ; if flag not set then donot clear timer
    clr    RTO                ; clear radio timer

SKIPRTO

```

```

clr    radioc          ; clear the radio counter
clr    RFLAG           ; clear the radio flag
jp     RADIO_EXIT      ; return

```

```

.....
LEARN DEBOUNCES THE LEARN SWITCH 80mS
TIMES OUT THE LEARN MODE 30 SECONDS
DEBOUNCES THE LEARN SWITCH FOR ERASE 6 SECONDS
.....

```

```

LEARN
    srp    #LEARNEE_GRP ; set the register pointer
    cp     STATE,#DN_POSITION ; test for motor stoped
    jr     z,TESTLEARN
    cp     STATE,#UP_POSITION ; test for motor stoped
    jr     z,TESTLEARN
    cp     STATE,#STOP        ; test for motor stoped
    jr     z,TESTLEARN
    ld     learnl,#0FFH        ; set the learn timer
    cp     learnl,#240D        ; test for the learn 30 second timeout
    jr     nz,ERASETEST       ; if not then test erase
    jr     learnoff            ; if 30 seconds then turn off the learn mode

TESTLEARN
    cp     learndb,#236D       ; test for the debounced release
    jr     nz,LEARNNOTRELEASED ; if the debouncer not released then jump

    clr     learndb            ; clear the debouncer

    ret                        ; return

LEARNNOTRELEASED:
    cp     learnl,#0FFH        ; test for learn mode
    jr     nz,INLEARN          ; if in learn jump
    cp     learndb,#20D        ; test for debounce period
    jr     nz,ERASETEST        ; if not then test the erase period

SETLEARN:
    clr     learnl              ; clear the learn timer
    ld     learndb,#0FFH        ; set the debouncer
    and     ledport,#ted        ; turn on the led
    clr     VACFLAG             ; clear vacation mode
    ld     address,#1EH         ; set the non vol address for vacation
    clr     mtemp               ; clear the data for cleared vacation
    clr     mtemp               ;
    ld     skipradio,#0FFH      ; set the flag
    call    WRITEMEMORY         ; write the memory
    clr     skipradio           ; clear the flag

ERASETEST:
    cp     learndb,#0FFH        ; test for learn button active
    jr     nz,ERASERELEASE      ; if button released set the erase timer
    cp     eraset,#0FFH         ; test for timer active
    jr     nz,ERASETIMING       ; if the timer active jump
    clr     eraset              ; clear the erase timer

ERASETIMING
    cp     eraset,#48D          ; test for the erase period
    jr     z,ERASETIME          ; if timed out the erase
    ret                        ; else we return

```

```

ERASETIME
    or    ledport,#ledh      ; turn off the led
    ld    skipradio,#0FFH    ; set the flag to skip the radio read
    call  CLEARCODES        ; clear all codes in memory
    clr   skipradio          ; reset the flag to skip radio

    ld    learnt,#0FFH       ; set the learn timer
    ret                                ; return

ERASERELEASE:
    ld    eraset,#0FFH       ; turn off the erase timer
    ret                                ; return

INLEARN
    cp    learndb,#20D        ; test for the debounce period
    jr    nz,TESTLEARNTIMER   ; if not then test the learn timer for time out
    ld    learndb,#0FFH       ; set the learn db

TESTLEARNTIMER
    cp    learnt,#240D        ; test for the learn 30 second timeout
    jr    nz,ERASETEST        ; if not then test erase

learnoff
    or    ledport,#ledh      ; turn off the led
    ld    learnt,#0FFH       ; set the learn timer
    ld    learndb,#0FFH      ; set the learn debounce
    jr    ERASETEST          ; test the erase timer

```

```

.....
WRITE WORD TO MEMORY
ADDRESS IS SET IN REG ADDRESS
DATA IS IN REG MTEMPH AND MTEMPL
RETURN ADDRESS IS UNCHANGED
.....

```

```

WRITEMEMORY:
    push  RP                  ; SAVE THE RP
    srp   #LEARNEE_GRP        ; set the register pointer

    call  STARTB               ; output the start bit
    ld    serial,#00110000B    ; set byte to enable write
    call  SERIALOUT            ; output the byte
    and   csport,#csl         ; reset the chip select
    call  STARTB               ; output the start bit
    ld    serial,#01000000B    ; set the byte for write
    or    serial,address       ; or in the address
    call  SERIALOUT            ; output the byte
    ld    serial,mtempH        ; set the first byte to write
    call  SERIALOUT            ; output the byte
    ld    serial,mtempl        ; set the second byte to write
    call  SERIALOUT            ; output the byte
    call  ENDWRITE             ; wait for the ready status
    call  STARTB               ; output the start bit
    ld    serial,#00000000B    ; set byte to disable write
    call  SERIALOUT            ; output the byte
    and   csport,#csl         ; reset the chip select

```

```

pop    RP                ; reset the RP
ret

```

```

.....
READ WORD FROM MEMORY
ADDRESS IS SET IN REG ADDRESS
DATA IS RETURNED IN REG MTEMPH AND MTEMPL
ADDRESS IS UNCHANGED
.....

```

READMEMORY:

```

push    RP                ;
srp     #LEARNEE_GRP      ; set the register pointer

call    STARTB            ; output the start bit
ld      serial,#10000000B  ; preamble for read
or      serial,address    ; or in the address
call    SERIALOUT         ; output the byte
call    SERIALIN          ; read the first byte
ld      mtempH,serial      ; save the value in mtempH
call    SERIALIN          ; read the second byte
ld      mtempL,serial      ; save the value in mtempL
and     csport,#csl       ; reset the chip select
pop     RP
ret

```

```

.....
WRITE CODE TO 2 MEMORY ADDRESS
CODE IS IN RADIO1H RADIO1L RADIO3H RADIO3L
.....

```

WRITECODE

```

push    RP                ;
srp     #LEARNEE_GRP      ; set the register pointer
ld      mtempH,RADIO1H    ; transfer the data from radio 1 to the temps
ld      mtempL,RADIO1L
call    WRITEMEMORY       ; write the temp bits
inc     address           ; next address
ld      mtempH,RADIO3H    ; transfer the data from radio 3 to the temps
ld      mtempL,RADIO3L
call    WRITEMEMORY       ; write the temps
pop     RP
ret                        ; return

```

```

.....
CLEAR ALL RADIO CODES IN THE MEMORY
.....

```

CLEARCODES

```

push    RP                ;
srp     #LEARNEE_GRP      ; set the register pointer
ld      RADIO1H,#0FFH     ; set the codes to illegal codes
ld      RADIO1L,#0FFH
ld      RADIO3H,#0FFH
ld      RADIO3L,#0FFH
ld      address,#00H      ; clear address 0

```

CLEARC:

```

call    WRITECODE         ; "A0"

```

```

inc    address      ; set the next address
cp     address,#1BH ; test for the last address of radio
jr     ui1 CLEARC
clr    mtemp        ; clear data
clr    mtemp
ld     address,#1FH ; clear address F
call   WRITEMEMORY
pop    RP
ret

```

```

.....
; START BIT FOR SERIAL NONVOL
; ALSO SETS DATA DIRECTION AND AND CS
.....

```

STARTB

```

and    csport,#csl ;
and    clkport,#clockl ; start by cleaning the bits
and    dioport,#dol
ld     P2M,#(P2M_INIT+0) ; set port 2 mode forcing output mode data
or     csport,#csh ; set the chip select
or     dioport,#doh ; set the data out high
or     clkport,#clockh ; set the clock
and    clkport,#clockl ; reset the clock low
and    dioport,#dol ; set the data low
ret

```

```

.....
; END OF CODE WRITE
.....

```

ENDWRITE

```

and    csport,#csl ; reset the chip select
nop
or     csport,#csh ; set the chip select
ld     P2M,#(P2M_INIT+4) ; set port 2 mode forcing input mode data

```

ENDWRITELOOP

```

ld     temp,dioport ; read the port
and    temp,#doh ; mask
jr     z,ENDWRITELOOP ; if the bit is low then loop till we are done
and    csport,#csl ; reset the chip select
ld     P2M,#(P2M_INIT+0) ; set port 2 mode forcing output mode
ret

```

```

.....
; SERIAL OUT
; OUTPUT THE BYTE IN SERIAL
.....

```

SERIALOUT:

```

ld     P2M,#(P2M_INIT+0) ; set port 2 mode forcing output mode data
ld     temp,#8H ; set the count for eight bits

```

SERIALOUTLOOP

```

rlc    serial ; get the bit to output into the carry
jr     nc,ZEROOUT ; output a zero if no carry

```

ONEOUT:

```

or     dioport,#doh ; set the data out high

```



```

or      clkport,#clockh      ; set the clock high
and     clkport,#clockl      ; reset the clock low
and     dioport,#dol         ; reset the data out low
djnz    templ,SERIALOUTLOOP

ret                                           ; loop till done
; return

ZEROOUT:
and     dioport,#dol         ; reset the data out low
or      clkport,#clockh      ; set the clock high
and     clkport,#clockl      ; reset the clock low
and     dioport,#dol         ; reset the data out low
djnz    templ,SERIALOUTLOOP

ret                                           ; loop till done
; return

.....
SERIAL IN
INPUTS A BYTE TO SERIAL
.....
SERIALIN
ld      P2M,#(P2M_INIT+4)    ; set port 2 mode forcing input mode data
ld      templ,#8H            ; set the count for eight bits

SERIALINLOOP:
or      clkport,#clockh      ; set the clock high
rcf                                           ; reset the carry flag
ld      temph,dioport        ; read the port
and     temph,#doh           ; mask out the bits
jr      z,DONTSET
scf                                           ; set the carry flag

DONTSET
rlc      serial              ; get the bit into the byte
and     clkport,#clockl      ; reset the clock low
djnz    templ,SERIALINLOOP

ret                                           ; loop till done
; return

.....
TIMER UPDATE FROM INTERRUPT EVERY 1mS
.....
TIMERUD:
dec      T0EXT                ; decrement the T0 extension
inc      TASKSWITCH           ; set to the next switch
and     TASKSWITCH,#00000111B ; 0-7
tm      TASKSWITCH,#00000001B ; test for odd
jr      nz,TK1357             ; if so then jump
cp      TASKSWITCH,#2d        ; test for 2
jr      z,TASK2
cp      TASKSWITCH,#4d        ; test for 4
jr      z,TASK4
cp      TASKSWITCH,#6d        ; test for 6
jr      z,TASK6

TASK0
or      IMR,#RETURN_IMR      ; turn on the interrupt
ei
push    rp                   ; save the rp

```

```

srp    #TIMER_GROUP    ; set the rp for the switches
call   switches        ; test the switches
pop    rp
iret

```

TASK2:

```

or     IMR,#RETURN_IMR ; turn on the interrupt
ei
push   rp              ; save the rp
srp    #TIMER_GROUP    ;
call   STATEMACHINE    ; do the motor function
pop    rp              ; return the rp
iret

```

TASK4

```

or     IMR,#RETURN_IMR ; turn on the interrupt
ei
push   rp              ; save the rp
srp    #TIMER_GROUP    ; set the rp for the switches
call   switches        ; test the switches
pop    rp
iret

```

TK1357

```

cp     TASKSWITCH,#05D ; test for task 5
jp     nz,TASK1357EXIT ;

```

TASK5

```

cp     PWM_STATUS,#0FFH
jr     nc,enable_t1    ;
dec    PWM_OFF         ; discharge for at least 2x
jr     nz,continue     ;
ld     PWM_STATUS,#00H

```

enable\_t1

```

ld     PWM_OFF,#14H    ;
or     p3,#PWM_HI      ; take pwm pin high
or     tmr,#TIMER_1_EN ; enable t1

```

continue

```

jp     TASK1357EXIT    ; EXIT UPDATING TIMERS

```

TASK6.

```

or     IMR,#RETURN_IMR ; turn on the interrupt
ei
push   rp              ; save the rp
srp    #TIMER_GROUP    ;
call   STATEMACHINE    ; do the motor function
pop    rp              ; return the rp
iret

```

TASK1357EXIT

```

push   RP

```

```

or      IMR,#RETURN_IMR      ; turn on the interrupt
ei
call    RS232                  ; do the rs232 buss
tm      TASKSWITCH,#00000001B ; test for state a 1 in b0
jr      z,ONEMS
tm      TASKSWITCH,#00000010B ; test for state a 1 in b1
jr      z,ONEMS
srp     #TIMER_GROUP          ; if a 3 or 7 then do the auxlight
call    AUXLIGHT              ;

ONEMS
srp     #LEARNER_GRP          ; set the register pointer
dec     AOBSTEST              ; decrease the aobs test timer
jr      nz,NOFAIL            ; if the timer not at 0 then it didnot fail
ld      AOBSTEST,#11d         ; if it failed reset the timer
or      AOBSTF,#00000001b     ; set the failed flag bit

NOFAIL
inc     t4ms                  ; increment the 4mS timer
inc     t125ms                ; increment the 125 mS timer
cp      t4ms,#4D              ; test for the time out
jp      nz,TEST125            ; if not true then jump

FOURMS
clr     t4ms                  ; reset the timer
cp      RPMONES,#00H          ; test for the end of the one sec timer
jr      z,TESTPERIOD          ; if one sec over then test the pulses
                                ; over the period
dec     RPMONES               ; else decrease the timer
di
clr     RPM_COUNT              ; start with a count of 0
clr     BRPM_COUNT             ; start with a count of 0
ei
jr      RPMTDONE

TESTPERIOD
cp      RPMCLEAR,#00H          ; test the clear test timer for 0
jr      nz,RPMTDONE           ; if not timed out then skip
ld      RPMCLEAR,#122d         ; set the clear test time for next cycle .5
cp      RPM_COUNT,#50d         ; test the count for too many pulses
jr      ugt,FAREV              ; if too man pulses then reverse
di
clr     RPM_COUNT              ; clear the counter
clr     BRPM_COUNT            ; clear the counter
ei
clr     FAREVFLAG              ; clear the flag temp test
jr      RPMTDONE               ; continue

FAREV
ld      FAULTCODE,#06h         ; set the fault flag
ld      FAREVFLAG,#088H        ; set the forced up flag
and     p0,#^LB ^C WORKLIGHT ; turn off light
ld      REASON,#80H            ; rpm forcing up motion
call    SET_AREV_STATE         ; set the autorev state

RPMTDONE
dec     RPMCLEAR               ; decrement the timer
cp      LIGHT1S,#00           ; test for the end
jr      z,SKIPLIGHTE
dec     LIGHT1S                ; down count the light time

SKIPLIGHTE

```

```

                                inc    R_DEAD_TIME
                                cp      RTO,#101D      ; test for the radio time out
                                jr      ult,DONOTCB     ; if not timed out donot clear b
                                clr     BCODEFLAG      ; else clear the b code flag
DONOTCB
                                inc     RTO            ; increment the radio time out
                                jr      nz,RTOOK       ; if the radio timeout ok then skip
                                dec     RTO            ; back turn
RTOOK
                                cp      RRTO,#0FFH     ; test for roll
                                jr      z,SKIPRRTO     ; if so then skip
SKIPRRTO
                                inc     RRTO
                                ld      temp,psport    ; read the program switch
                                and     temp,#psmask   ; mask for switch
                                jr      z,PRSWCLOSED   ; if the switch is closed count up
                                cp      leamdb,#00     ; test for the non decrement point
                                jr      z,LEARNDDBOK   ; if at end skip dec
                                dec     leamdb
                                jr      LEARNDDBOK
PRSWCLOSED
                                inc     leamdb         ; increase the learn debounce timer
                                cp      leamdb,#0H     ; test for overflow
                                jr      nz,LEARNDDBOK ; if not 0 skip back turning
                                dec     leamdb
LEARNDDBOK
TEST125
                                cp      t125ms,#125D   ; test for the time out
                                jr      z,ONE25MS     ; if true the jump
                                cp      t125ms,#63D   ; test for the other timeout
                                jr      nz,N125
                                call    FAULTB
N125
                                pop     RP
                                iret
ONE25MS
                                cp      AUXLEARNSW,#0FFH ; test for the rollover position
                                jr      z,SKIPPAUXLEARNSW ; if so then skip
                                inc     AUXLEARNSW     ; increase
SKIPPAUXLEARNSW:
                                cp      ZZWIN,#0FFH    ; test for the roll position
                                jr      z,TESTFA      ; if so skip
                                inc     ZZWIN          ; if not increase the counter
TESTFA
                                call    FAULTB         ; call the fault blinker
                                clr     t125ms        ; reset the timer
                                inc     DOG2          ; increase the second watch dog
                                di
                                inc     SDISABLE      ; count off the system disable timer
                                jr      nz,DO12       ; if not rolled over then do the 1.2 sec
                                dec     SDISABLE      ; else reset to FF
DO12
                                cp      ONEP2,#00     ; test for 0
                                jr      z,INCLEARN     ; if counted down then increment learn

```



```

swap    FAULT      ;
jr      FIRSTFC    ;

NOAobsFAULT
clr     FAULTCODE   ; clear the fault code
clr     AOBSF       ; clear flags

FIRSTFAULT.
cp      FAULT,#00    ; test for no fault
jr      z,NOFAULT
ld      FAULTFLAG,#OFFH ; set the fault flag
cp      LEARNI,#OFFH ; test for not in learn mode
jr      nz,TESTSDI   ; if in learn then skip setting
cp      FAULT,FAULTTIME ;
jr      ULE,TESTSDI

tm      FAULTTIME,#00001000b ; test the 1 sec bit
jr      nz,BITONE
and     ledport,#iedl ; turn on the led
ret

BITONE
or      ledport,#iedh ; turn off the led

TESTSDI.
ret

NOFAULT
clr     FAULTFLAG   ; clear the flag
ret

```

---

MOTOR STATE MACHINE

---

```

STATEMACHINE
call    RS232
xor     p0,#00001000b ; toggle aux output
dec     FORCE_PRE       ; dec the prescaler
cp      DOG2,#8d       ; test the 2nd watchdog for problem
jp      ugt,START      ; if problem reset
cp      STATE,#06d     ; test for legal number
jp      ugt,start      ; if not the reset
jp      z,stop         ; stop motor 6
cp      STATE,#03d     ; test for legal number
jp      z,start        ; if not the reset
cp      STATE,#00d     ; test for autorev
jp      z,auto_rev     ; auto reversing 0
cp      STATE,#01d     ; test for up
jp      z,up_direction ; door is going up 1
cp      STATE,#02d     ; test for autorev
jp      z,up_position  ; door is up 2
cp      STATE,#04d     ; test for autorev
jp      z,dn_direction ; door is going down 4
jp      dn_position    ; door is down 5

```

---

AUX OBSTRUCTION OUTPUT AND LIGHT FUNCTION

---



AUXLIGHT  
test\_light\_on.

```

cp    LIGHT_FLAG,#LIGHT
jr    z,dec_pre_light
cp    LIGHT1S,#00          ; test for no flash
jr    z,NO1S               ; if not skip
cp    LIGHT1S,#01d         ; test for timeout
jr    nz,NO1S              ; if not skip
xor    p0,#WORKLIGHT       ; toggle light
clr    LIGHT1S              ; oneshot

```

NO1S

```

cp    FLASH_FLAG,#FLASH
jr    nz,dec_pre_light
decw   FLASH_DELAY          ; 250 ms period
jr    nz,dec_pre_light
xor    p0,#WORKLIGHT        ; toggle light
ld     FLASH_DELAY_HI,#FLASH_HI
ld     FLASH_DELAY_LO,#FLASH_LO
dec    FLASH_COUNTER
jr    nz,dec_pre_light
clr    FLASH_FLAG

```

dec\_pre\_light.

```

cp    LIGHT_TIMER_HI,#0FFH  ; test for the timer ignore
jr    z,exit_light          ; if set then ignore
dec    PRE_LIGHT            ; dec 3 byte light timer
jr    nz,exit_light
decw   LIGHT_TIMER
jr    nz,exit_light         ; if timer 0 turn off the light
and    p0,#^C LIGHT_ON      ; turn off the light

```

exit\_light

```

ret                                ; return

```

#### AUTO\_REV ROUTINE

auto\_rev

```

cp    FAREVFLAG,#088H      ; test for the forced up flag
jr    nz,LEAVEREV
and    p0,#^LB ^C WORKLIGHT ; turn off light
clr    FAREVFLAG           ; one shot temp test

```

LEAVEREV.

```

WDT
call   HOLDFREX            ; kick the dog
ld     LIGHT_FLAG,#LIGHT    ; hold off the force reverse
and    p0,#^LB ^C MOTOR_UP ^& ^C MOTOR_DN ; force the light on no blink ; disable motor
di
decw   AUTO_DELAY          ; wait for .5 second
decw   BAUTO_DELAY         ; wait for .5 second
ei
jr    nz,arswitch          ; test switches

```

```

or     p0,#00001000b        ; set aux output for FEMA

```

```

tm      p2 #UP_LIMIT          ; test the limit
jr      nz,NOUPLIM            ; if limit set stop
LD      REASON,#60H           ; set the reason as early limit
jp      SET_STOP_STATE        ; set stop

NOUPLIM      ld      REASON,#40H          ; set the reason for the change
jp      SET_UP_DIR_STATE              ; set the state

arswitch      ld      REASON,#00H          ; set the reason to command
cp      SW_DATA,*CMD_SW                ; test for a command
jp      z,SET_STOP_STATE                ; if so then stop
ld      REASON,#10H                    ; set the reason as radio command
cp      RADIO_CMD,#0AAH                ; test for a radio command
jp      z,SET_STOP_STATE                ; if so the stop

exit_auto_rev      ret                  ; return

HOLDFREV      ld      RPMONES,#244d        ; set the hold off
ld      RPMCLEAR,#122d                  ; clear rpm reverse .5 sec
di
clr      RPM_COUNT                      ; start with a count of 0
clr      BRPM_COUNT                    ; start with a count of 0
ei
ret

```

---

DOOR GOING UP

---

```

up_direction      WDT                  ; kick the dog
call      HOLDFREV                    ; hold off the force reverse
ld      LIGHT_FLAG,#LIGHT              ; force the light on no blink
and      p0,#^LB ^C MOTOR_DN -        ; disable down relay

cp      MOTDEL,#0FFH                  ; test for done
jr      z,UPON                        ; if done skip delay
mc      MOTDEL                        ; increase the delay timer
or      p0,#LIGHT_ON                  ; turn on the light
cp      MOTDEL,#20d                    ; test for 40 seconds
jr      uie,UPOFF                      ; if not timed

UPON              or      p0,#MOTOR_UP ^| #LIGHT_ON ; turn on the motor and light
UPOFF

cp      FORCE_IGNORE,#01                ; test fro the end of the force ignore
jr      nz,SKIPUPRPM                  ; if not donot test rpmcount
cp      RPM_ACOUNT,#02H                ; test for less the 2 pulses
ujr      ugt,SKIPUPRPM
ld      FAULTCODE,#05h

SKIPUPRPM      cp      FORCE_IGNORE,#00          ; test timer for done
jr      nz,test_up_sw_pre              ; if timer not up do not test force

```



```

TEST_UP_FORCE
    di
    dec RPM_TIME_OUT          ; decrease the timeout
    dec BRPM_TIME_OUT         ; decrease the timeout
    ei
    jr z.failed_up_rpm
    di                          ; turn off the interrupt
    ld RPM_SET_DIFF_LO.UP_FORCE_LO
    ld RPM_SET_DIFF_HI.UP_FORCE_HI
    sub RPM_SET_DIFF_LO.RPM_PERIOD_LO
    sbc RPM_SET_DIFF_HI.RPM_PERIOD_HI
    tm RPM_SET_DIFF_HI.#10000000B ; test high bit for sign
    jr z.test_up_sw           ; if the rpm period is ok then switch

failed_up_rpm
    ld REASON.#20H            ; set the reason as force
    jp SET_STOP_STATE

test_up_sw_pre
    tm FORCE_PRE.#00000001B    ; test for odd /2
    jr nz,test_up_sw          ; if odd skip
    di
    dec FORCE_IGNORE
    dec BFORCE_IGNORE

test_up_sw
    ei                          ; enable interrupt
    tm p2.#UP_LIMIT           ; have we reached the limit?
    jr z.up_limit_dec
    ld limit.#LIMIT_COUNT
    jr get_sw

up_limit_dec
    djnz limit.get_sw          ; dec debounce count
    ld REASON.#50H            ; set the reason as limit
    jp SET_UP_POS_STATE

get_sw
    ld REASON.#10H            ; set the radio command reason
    cp RADIO_CMD.#0AAH        ; test for a radio command
    jr z.SET_STOP_STATE       ; if so stop
    ld REASON.#00H            ; set the reason as a command
    cp SW_DATA.#CMD_SW        ; test for a command condition
    jr ne.test_up_time
    jp SET_STOP_STATE

test_up_time
    ld REASON.#70H            ; set the reason as a time out
    decw MOTOR_TIMER          ; decrement motor timer
    jp z.SET_STOP_STATE

exit_up_dir
    ret                        ; return to caller

-----
DOOR UP
-----

up_position.
    WDT                        ; kick the dog
    cp FAREVFLAG.#0B8H        ; test for the forced up flag
    jr nz.LEAVELIGHT
    and p0.#^LB^C WORKLIGHT   ; turn off light
    jr UPNOFLASH              ; skip clearing the flash flag

```

```

LEAVELIGHT
UPNOFLASH    ld    LIGHT_FLAG,#00H          ; allow blink
              ld    limit #LIMIT_COUNT
              and   p0,#^LB ^C MOTOR_UP ^& #^C MOTOR_DN ; disable motor
              cp    SW_DATA,#LIGHT_SW        ; light sw debounced?
              jr    z,work_up
              ld    REASON,#10H              ; set the reason as a radio command
              cp    RADIO_CMD,#0AAH          ; test for a radio cmd
              jr    z,SETDNDIRSTATE          ; if so start down
              ld    REASON,#00H              ; set the reason as a command
              cp    SW_DATA,#CMD_SW          ; command sw debounced?
              jr    z,SETDNDIRSTATE          ; if command
              ret
SETDNDIRSTATE
              ld    ONEP2,#10D                ; set the 1 2 sec timer
              jp    SET_DN_DIR_STATE

work_up
              xor    p0,#WORKLIGHT           ; toggle work light
              ld    LIGHT_TIMER_HI,#0FFH      ; set the timer ignore
up_pos_ret
              ret                             ; return
-----
DOOR GOING DOWN
-----

dn_direction
              wdt
              call  HOLDREV                   ; kick the dog
              clr   FLASH_FLAG               ; hold off the force reverse
              ld    LIGHT_FLAG,#LIGHT         ; turn off the flash
              and   p0,#^LB ^C MOTOR_UP       ; force the light on no blink
              cp    MOTDEL,#0FFH              ; turn off motor up
              jr    z,DNON                    ; test for done
              inc   MOTDEL                    ; if done skip delay
              or    p0,#LIGHT_ON              ; increase the delay timer
              cp    MOTDEL,#20d               ; turn on the light
              jr    ule,DNOFF                 ; test for 40 seconds
              ; if not timed

DNON
DNOFF         or    p0,#MOTOR_DN ^| #LIGHT_ON ; turn on the motor and light
              cp    FORCE_IGNORE,#01          ; test fro the end of the force ignore
              jr    nz,SKIPDNRPM              ; if not donot test rpmcount
              cp    RPM_ACOUNT,#02H         ; test for less the 2 pulses
              jr    ugt,SKIPDNRPM
              ld    FAULTCODE,#05h
SKIPDNRPM:
              cp    FORCE_IGNORE,#00          ; test timer for done
              jr    nz,test_dn_sw_pre         ; if timer not up do not test force
              cp    ForcedDown,#1h           ; test the flag to skip rpm if forcing down
              jr    z,test_dn_sw_pre

TEST_DOWN_FORCE:
              di

```

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```

dec RPM_TIME_OUT          ; decrease the timeout
dec BRPM_TIME_OUT         ; decrease the timeout
ei
jr z,failed_dn_rpm
di                          ; turn off the interrupt
ld RPM_SET_DIFF_LO,DN_FORCE_LO
ld RPM_SET_DIFF_HI,DN_FORCE_HI
sub RPM_SET_DIFF_LO,RPM_PERIOD_LO
sbc RPM_SET_DIFF_HI,RPM_PERIOD_HI
tm RPM_SET_DIFF_HI,#10000000B ; test high bit for sign
jr z,test_dn_sw            ; if the rpm period is ok then switch

failed_dn_rpm
ld REASON,#20H             ; set the reason as force
jp SET_AREV_STATE         ; set the state

test_dn_sw_pre
tm FORCE_PRE,#00000001B    ; test for odd /2
jr nz,test_dn_sw          ; if odd skip
di
dec FORCE_IGNORE
dec BFORCE_IGNORE

test_dn_sw
ei                          ; turn on the interrupt
tm p2,#DN_LIMIT           ; are we at down limit?
jr z,dn_limit_dec
ld limit,#LIMIT_COUNT    ; reset the limit
jr call_sw_dn

dn_limit_dec
djnz limit,call_sw_dn     ; dec debounce counter
ld REASON,#50H            ; set the reason as a limit
cp CMD_DEB,#0FFH          ; test for the switch still held
jr nz,TESTRADIO
ld REASON,#90H            ; closed with the control held
jr TESTFORCEIG

TESTRADIO
cp LAST_CMD,#00           ; test for the last command being radio
jr nz,TESTFORCEIG        ; if not test force
cp BCODEFLAG,#077H        ; test for the b code flag
jr nz,TESTFORCEIG
ld REASON,#0A0H           ; set the reason as b code to limit

TESTFORCEIG
cp ForcedDown,#00         ; test for force down action
jr nz,NOAREVDN           ; if set skip early limits
cp FORCE_IGNORE,#00H       ; test the force ignore for done
jr z,NOAREVDN            ; a rev if limit before force enabled
ld REASON,#60h           ; early limit
jp SET_AREV_STATE        ; set autoreverse

NOAREVDN:
and p0,#*LB ^C MOTOR_DN
jp SET_DN_POS_STATE      ; set the state

call_sw_dn:
ld REASON,#10H            ; set the reason as radio command
cp RADIO_CMD,#0AAH        ; test for a radio command
jp z,SET_AREV_STATE       ; if so arev
ld REASON,#00H            ; set the reason as command
cp SW_DATA,#CMD_SW        ; test for command

```

```

test_dn_time.  jp      z,SET_AREV_STATE      ;
               ld      REASON,#70H          ; set the reason as timeout
               decw    MOTOR_TIMER          ; decrement motor timer
               jp      z,SET_AREV_STATE      ;
dec_obs_count  djnz    obs_count,exit_dn_dir ; dec aux obs count
               cp      LAST_CMD,#00         ; test for the last command from radio
               jr      z,OBSTESTB           ; if last command was a radio test b
               cp      CMD_DEB,#0FFH        ; test for the command switch holding
               jr      nz,OBSAREV           ; if the command switch is not holding
               ; do the autorev
               ; otherwise skip
               ret
OBSAREV.       ld      FLASH_FLAG,#0FFH     ; set flag
               ld      FLASH_COUNTER,#20    ; set for 10 flashes
               ld      FLASH_DELAY_HI,#FLASH_HI ; set for .5 Hz period
               ld      FLASH_DELAY_LO,#FLASH_LO
               ld      REASON,#30H          ; set the reason as autoreverse
               jp      SET_AREV_STATE
OBSTESTB       cp      BCODEFLAG,#077H     ; test for the b code flag
               jr      nz,OBSAREV          ; if not b code then arev
exit_dn_dir.   ld      REASON,#0B0H         ; set the reason as command not held
               cp      FAREVFLAG,#088H     ; test forced up flag
               jr      nz,exit_2_dn        ; if the forced up flag clear skip
               cp      CMD_DEB,#0FFH        ; test for a held command
               jr      z,exit_2_dn         ; if the command is held keep going
               cp      LAST_CMD,#00         ; test for the last command being radio
               jr      nz,do_reverse        ; if not do reverse
               cp      BCODEFLAG,#077H     ; test for the b code flag
               jr      z,exit_2_dn         ; if set skip till either is released
do_reverse.    jp      SET_AREV_STATE       ; set the autoreverse state
exit_2_dn      ret                          ; return

```

---

DOOR DOWN

---

```

dn_position:   WDT                          ; kick the dog
               cp      FAREVFLAG,#088H     ; test for the forced up flag
               jr      nz,DNLEAVEL         ;
               and     p0,#*LB ^C WORKLIGHT ; turn off light
               jr      DNNOFLASH           ; skip clearing the flash flag

               cp      ForcedDown,#01d     ; test for force in past
               jr      z,TestMotorRev       ; if so the test motor motion
               cp      MOTOR_TIMER,#00d    ; test for timed out
               jr      z,TestMotorRev       ; if timed out then test rev.
               decw    MOTOR_TIMER          ; decrement motor timer
               clr     RPM_ACOUNT         ; clear the rpm counter

```

```

TestMotorRev:  jr      SkipLock          ; skip the lock till 27 sec timeout
               tm      p2,#DN_LIMIT      ; is the down limit still set
               jr      z,SkipLock        ; then skip the lock down
               cp      RPM_ACOUNT,#10d  ; test for 2 rev
               jr      ule,SkipLock      ; if less skip the lock down
               ld      ForcedDown,#1h    ; set the flag to skip early limits
               jp      SET_DN_DIR_STATE   ; force the door down to lim

SkipLock
DNLEAVE:       ld      LIGHT_FLAG,#00H    ; allow blink

DNNOFLASH:     ld      limit,#LIMIT_COUNT ;
               and     p0,#^LB ^C MOTOR_UP ^&#^C MOTOR_DN ; disable motor
               cp      SW_DATA,#LIGHT_SW ; debounced? light
               jr      z,work_dn          ;
               ld      REASON,#10H        ; set the reason as a radio command
               cp      RADIO_CMD,#0AAH    ; test for a radio command
               jr      z,SETUPDIRSTATE    ; if so go up
               ld      REASON,#00H        ; set the reason as a command
               cp      SW_DATA,#CMD_SW    ; command sw pressed?
               jr      z,SETUPDIRSTATE    ; if so go up
               ret

SETUPDIRSTATE: ld      ONEP2,#10D         ; set the 1.2 sec timer
               jp      SET_UP_DIR_STATE

work_dn        xor     p0,#WORKLIGHT     ; toggle work light
               ld      LIGHT_TIMER_HI,#OFFH ; set the timer ignore

dn_pos_ret     ret                       ; return

;-----
; STOP
;-----

stop
WDT            WDT                     ; Kick the dog
               cp      FAREVFLAG,#088H   ; test for the forced up flag
               jr      nz,LEAVESTOP
               and     p0,#^LB ^C WORKLIGHT ; turn off light

LEAVESTOP:     ld      LIGHT_FLAG,#00H    ; allow blink
               and     p0,#^LB ^C MOTOR_UP ^&#^C MOTOR_DN ; disable motor
               cp      SW_DATA,#LIGHT_SW ; debounced? light
               jr      z,work_stop        ;
               ld      REASON,#10H        ; set the reason as radio command
               cp      RADIO_CMD,#0AAH    ; test for a radio command
               jp      z,SET_DN_DIR_STATE ; if so go down
               ld      REASON,#00H        ; set the reason as a command
               cp      SW_DATA,#CMD_SW    ; command sw pressed?
               jp      z,SET_DN_DIR_STATE ; if so go down
               ret

work_stop:     xor     p0,#WORKLIGHT     ; toggle work light

```

```

stop_ret:    ld    LIGHT_TIMER_HI,#OFFH    ; set the timer ignore
            ret                                ; return

```

---

SET THE AUTOREV STATE

---

```

SET_AREV_STATE:
            di
            ld    STATE,#AUTO_REV        ; if we got here, then reverse motor
            jr    SET_ANY

```

---

SET THE STOPPED STATE

---

```

SET_STOP_STATE:
            di
            ld    STATE,#STOP
            jr    SET_ANY

```

---

SET THE DOWN DIRECTION STATE

---

```

SET_DN_DIR_STATE:
            di
            ld    STATE,#DN_DIRECTION    ; energize door
            clr    FAREVFLAG              ; one shot the forced reverse
            tm     p2,#DN_LIMIT           ; are we at down limit?
            jr     nz,SET_ANY             ; if not at limit set dn
            ; else set the dn position

```

---

SET THE DOWN POSITION STATE

---

```

SET_DN_POS_STATE:
            di
            ld    STATE,#DN_POSITION    ; load new state
            jr    SET_ANY

```

---

SET THE UP DIRECTION STATE

---

```

SET_UP_DIR_STATE:
            di
            clr    ForcedDown             ; clear the flag for skipping early limit
            ld    STATE,#UP_DIRECTION
            tm     p2,#UP_LIMIT           ; have we reached the limit?
            jr     nz,SET_ANY             ; if not set the state
            ; else fall through and set pos state

```

---

SET THE UP POSITION STATE

---

```

SET_UP_POS_STATE:
            di
            ld    STATE,#UP_POSITION

```

---

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SET ANY STATE

SET\_ANY

```

ld    BSTATE,STATE          ; set the backup state
di
clr   RPM_COUNT             ; clear the rpm counter
clr   BRPM_COUNT            ;
ld    AUTO_DELAY_HI,#AUTO_HI ; set the .5 second auto rev timer
ld    AUTO_DELAY_LO,#AUTO_LO ;
ld    BAUTO_DELAY_HI,#AUTO_HI ; set the .5 second auto rev timer
ld    BAUTO_DELAY_LO,#AUTO_LO ;
ld    FORCE_IGNORE,#ONE_SEC  ; set the force ignore timer to one sec
ld    BFORCE_IGNORE,#ONE_SEC ; set the force ignore timer to one sec
ei
clr   RADIO_CMD              ; one shot
clr   RPM_ACOUNT           ; clear the rpm active counter
ld    LIMIT,#LIMIT_COUNT    ;
ld    MOTOR_TIMER_HI,#MOTOR_HI
ld    MOTOR_TIMER_LO,#MOTOR_LO
ld    STACKREASON,REASON     ; save the temp reason
ld    STACKFLAG,#OFFH        ; set the flag

TURN_ON_LIGHT:
ld    LIGHT_TIMER_HI,#SET_TIME_HI ; set the light period
ld    LIGHT_TIMER_LO,#SET_TIME_LO ;
ld    PRE_LIGHT,#SET_TIME_PRE     ;
ld    LIGHTS,P0                 ; read the light state
and   LIGHTS,#WORKLIGHT         ;
jr    nz,lighton                ; if the light is on skip clearing

lightoff
clr   MOTDEL                  ; clear the motor delay

lighton
ret

```

THIS THE AUXILARY OBSTRUCTION INTERRUPT ROUTINE

AUX\_OBS

```

ld    OBS_COUNT,#6D          ; reset pulse counter (no obstruction)
and   imr,#11110111b         ; turn off the interrupt for up to 500uS
ld    AOBSTEST,#11D          ; reset the test timer
or    AOBSTEST,#00000010B    ; set the flag for got a aobs
iret                          ; return from int .

```

THIS IS THE MOTOR RPM INTERRUPT ROUTINE

RPM:

```

push  rp                     ; save current pointer
srp   #RPM_GROUP             ; point to these reg
ld    rpm_temp_hi,T0EXT       ; read the timer extension
ld    rpm_temp_lo,T0          ; read the timer
tm    IRQ.#00010000B          ; test for a pending interrupt
jr    z,RPMTIMEOK             ; if not then time ok

RPMTIMEERROR

```

```

tm      rpm_temp_lo,#1000000B      ; test for timer reload
jr      z,RPMTIMEOK                ; if no reload time is ok
dec     rpm_temp_hi                 ; if reloaded then dec the hi to resync

RPMTIMEOK:
and     imr,#11111011b             ; turn off the interrupt for up to 500uS

ld      rpm_2past_hi,rpm_past_hi    ; save the past for testing
ld      rpm_2past_lo,rpm_past_lo    ;
ld      rpm_past_hi,rpm_temp_hi     ; transfer the present into the past
ld      rpm_past_lo,rpm_temp_lo     ;
ld      rpm_diff_hi,rpm_2past_hi    ; transfer the past into the difference
ld      rpm_diff_lo,rpm_2past_lo    ;
sub     rpm_diff_lo,rpm_past_lo      ; find the difference
sbc     rpm_diff_hi,rpm_past_hi      ;
tm      rpm_diff_hi,#10000000b      ; test for neg number
jr      z,RPM_TIME_FOUND            ; if the time is correct then jump
ld      rpm_diff_hi,rpm_past_hi     ; transfer the temp into the difference
ld      rpm_diff_lo,rpm_past_lo     ;
sub     rpm_diff_lo,rpm_2past_lo    ; find the difference
sbc     rpm_diff_hi,rpm_2past_hi    ;

RPM_TIME_FOUND:
ld      rpm_period_hi,rpm_diff_hi    ; transfer the difference to the period
ld      rpm_period_lo,rpm_diff_lo    ;
ei
di
cp      rpm_period_hi,#12D           ; test for a period of at least 6.144mS
jr      ult,SKIPC                   ; if the period is less then skip counting
cp      STATE,#05h                  ; test for the down limit state
jr      z,CLRC                      ; if set clear the counter

TULS:
cp      STATE,#02H                  ; test for the up limit state
jr      nz,INCRPM                   ; if not then increment the rpm state
tm      P2,#UP_LIMIT                ; test for the up limit still set
jr      nz,INCRPM                   ; if not then set

CLRC:
clr     RPM_COUNT                   ; clear the rpm counter
clr     BRPM_COUNT                  ;
ei
jr      SKIPC                       ;

INCRPM:
inc     RPM_COUNT                   ; increase the rpm count
inc     BRPM_COUNT                  ; increase the rpm count
inc     RPM_ACOUNT                 ; increase the rpm count

SKIPC:
inc     RPM_ACOUNT                 ; increase the rpm count
di
ld      rpm_time_out,#15D            ; set the rpm max period as 30mS
ld      BRPM_TIME_OUT,#15D          ; set the rpm max period as 30mS
; if rpm not updated by then reverse

ei

SKIPPEDGE:
pop     rp                          ; return the rp
iret                                     ; return

```



---

 THIS IS THE SWITCH TEST SUBROUTINE
 

---

STATUS  
 0 => COMMAND TEST  
 1 => WORKLIGHT TEST  
 2 => VACATION TEST  
 3 => CHARGE

SWITCH DATA  
 0 => OPEN  
 1 => COMMAND CMD\_SW  
 2 => WORKLIGHT LIGHT\_SW  
 4 => VACATION VAC\_SW

---

switches.

```

call RS232
ei
clr SW_DATA           ; set the default to open "idle"
cp STATUS,#03d        ; test for illegal number
jp ugt.start          ; if so reset
jp z.charge           ; if it is 3 then goto charge
cp STATUS,#02d        ; test for vacation
jp z.VACATION_TEST    ; if so then jump
cp STATUS,#01d        ; test for worklight
jp z.WORKLIGHT_TEST   ; if so then jump
                     ; else it id command

```

COMMAND\_TEST:

```

cp VACFLAG,#00H       ; test for vacation mode
jr z.COMMAND_TEST1    ; if not vacation skip flash

inc VACFLASH          ; increase the vacation flash timer
cp VACFLASH,#10       ; test the vacation flash period
jr ult.COMMAND_TEST1  ; if lower period skip flash
and p3,#CCHARGE_SW    ; turn off wall switch
or p3,#DIS_SW         ; enable discharge
cp VACFLASH,#60d      ; test the time delay for max
jr nz,NOTFLASHED      ; if the flash is not done jump and ret
clr VACFLASH          ; restart the timer

```

NOTFLASHED:

```

ret                  ; return

```

COMMAND\_TEST1:

```

tm p0,#SWITCHES       ; command sw pressed?
jr nz,CMDOPEN          ; open command
tm P0,#10000000B       ; test the second command input
jr nz,CMDOPEN

```

CMDCLOSED:

```

call DECVAC           ; decrease vacation debounce
call DECLIGHT         ; decrease light debounce
cp CMD_DEB,#0FFH      ; test for the max number

```

```

                                jr      z,SKIPCMDINC      ; if at the max skip inc
                                di
                                inc     CMD_DEB           ; increase the debouncer
                                inc     BCMDEB            ; increase the debouncer
                                ei

SKIPCMDINC
                                op      CMD_DEB,#CMD_MAKE   ;
                                jr      nz,CMDEXIT         ; if not made then exit

GOT_A_CMD
                                di
                                ld      LAST_CMD,#055H     ; set the last command as command
                                ld      SW_DATA,#CMD_SW     ; set the switch data as command
                                op      AUXLEARN_SW,#100d   ; test the time
                                jr      ugt,SKIP_LEARN
                                push    RP
                                srp     #LEARNEE_GRP
                                call    SETLEARN           ; set the learn mode
                                clr     SW_DATA            ; clear the cmd
                                pop     RP
                                or      p0,#LIGHT_ON       ; turn on the light
                                call    TURN_ON_LIGHT      ; turn on the light

SKIP_LEARN
                                ld      CMD_DEB,#0FFH      ; set the debouncer to ff one shot
                                ld      BCMDEB,#0FFH      ; set the debouncer to ff one shot

CMDEXIT
                                ei
                                or      p3,#CHARGE_SW      ; turn on the charge system
                                and     p3,#CDIS_SW        ;
                                ld      SWITCH_DELAY,#CMD_DEL_EX ; set the delay time to 8mS
                                ld      STATUS,#CHARGE     ; charge time

CMDDELEXIT
                                ret

CMDOPEN
                                and     p3,#^LB ^C CHARGE_SW ; command switch open
                                or      p3,#DIS_SW         ; turn off charging sw
                                ld      DELAYC,#16d        ; enable discharge
                                ; set the time delay

DELLOOP
                                dec     DELAYC
                                jr      nz,DELLOOP        ; loop till delay is up
                                tm      p0,#SWITCHES      ; command line still high
                                jr      nz,TESTWL         ; if so return later
                                call    DECVAC             ; if not open line dec all debouncers
                                call    DECLIGHT
                                call    DECCMD
                                ld      AUXLEARN_SW,#0FFH  ; turn off the aux learn switch
                                jr      CMDEXIT            ; and exit

TESTWL
                                ld      STATUS,#WL_TEST     ; set to test for a worklight
                                ret                        ; return

WORKLIGHT_TEST
                                tm      p0,#SWITCHES      ; command line still high

```





```

call    DECLIGHT
ld      SWITCH_DELAY,#VAC_DEL_EX ; set the delay
ld      STATUS,#CHARGE           ; set the next test as charge
ret

charge
or      p3,#CHARGE_SW
and     p3,#CDIS_SW
dec     SWITCH_DELAY
jr      nz,charge_ret
ld      STATUS,#CMD_TEST

charge_ret
ret

DECCMD
cp      CMD_DEB,#00H              ; test for the min number
jr      z,SKIPCMDDEC              ; if at the min skip dec
di      CMD_DEB                  ; decrement debouncer
dec     BCMD_DEB                  ; decrement debouncer
ei

SKIPCMDDEC
cp      CMD_DEB,#CMD_BREAK        ; if not at break then exit
jr      nz,DECCMDEXIT            ; if not break then exit
clr     CMD_DEB                  ; reset the debouncer
clr     BCMD_DEB                  ; reset the debouncer
ei

DECCMDEXIT
ret                                  ; and exit

DECLIGHT
cp      LIGHT_DEB,#00H            ; test for the min number
jr      z,SKIPLIGHTDEC           ; if at the min skip dec
di      LIGHT_DEB                ; decrement debouncer
dec     LIGHT_DEB

SKIPLIGHTDEC
cp      LIGHT_DEB,#LIGHT_BREAK    ; if not at break then exit
jr      nz,DECLIGHTEXIT          ; if not break then exit
clr     LIGHT_DEB                ; reset the debouncer

DECLIGHTEXIT
ret                                  ; and exit

DECVAC:
cp      VAC_DEB,#00H              ; test for the min number
jr      z,SKIPVACDEC             ; if at the min skip dec
di      VAC_DEB                  ; decrement debouncer
dec     VAC_DEB

SKIPVACDEC
cp      VACFLAG,#00H              ; test for vacation rhode
jr      z,DECVACOUT              ; if not vacation use out time

DECVACIN
cp      VAC_DEB,#VAC_BREAK_IN     ; test for the vacation break point

```

```

        jr      nz,DECVACEXIT      ; exit if not
        jr      CLEARVACDEB
DECVACOUT:
        cp      VAC_DEB,#VAC_BREAK_OUT ; test for the vacation break point
        jr      nz,DECVACEXIT      ; exit if not
CLEARVACDEB
        clr     VAC_DEB            ; reset the debouncer
DECVACEXIT:
        ret                      ; and exit

```

---

THIS ROUTINE GENERATES THE RAMP FOR THE COMPARATORS

---

```

PWM:
        push    rp                ; save current pointer
        srp     #PWM_GROUP        ;
        and     p3,#^C PWM_HI     ; take pwm output low
        tm      p0,#DOWN_COMP     ; was it down force?
        jr      nz,test_up        ; no, test up force
        ld      dn_temp,pulsewidth ; save setting
test_up:
        tm      p0,#UP_COMP        ; up force trip?
        jr      nz,update_pwm     ; should be high
        ld      up_temp,pulsewidth ; save setting
update_pwm
        add     pulsewidth,#4      ; increase pulsewidth
        djnz    pwm_count,pwm_exit ;
GOT_FORCE_ADDRESS:
        ei      ; turn on stacked interrupts
        rcf     dn_temp            ; /2
        rcf     dn_temp            ; /2
        rcf     up_temp            ; /2
        rcf     up_temp            ; /2
        ld      DNFORCE,dn_temp    ; save the values
        ld      UPFORCE,up_temp
        cp      dn_temp,#064d      ; test the last address
        jr      ult,DN_ADDRESS_OK  ; if in the range ok
        ld      dn_temp,#064d      ; if out of the range set to the top
DN_ADDRESS_OK:
        ld      force_add_hi,dn_temp ; REVERSE THE ROTATION
        ld      dn_temp,#64d
        sub     dn_temp,force_add_hi
        ld      force_add_hi,#^hb force_table_60
        ld      force_add_lo,#^lb force_table_60

```

```

DN60
tm      p2,#00100000b      ; test the 50/60 bit
jr      nz,DN60
ld      force_add_hi,#^hb force_table_50
ld      force_add_lo,#^lb force_table_50

add     force_add_lo,dn_temp ; calculate the address add 2X temp
adc     force_add_hi,#00h    ;
add     force_add_lo,dn_temp ; calculate the address add 2X temp
adc     force_add_hi,#00h    ;

di
ldc     dn_force_hi,@force_add ; get hi byte
incw    force_add             ; get low byte
ldc     dn_force_lo,@force_add ;
ei

cp      up_temp,#064d        ; test the last address
jr      ult,UP_ADDRESS_OK    ; if in the range ok
ld      up_temp,#064d        ; if out of the range set to the top

UP_ADDRESS_OK

ld      force_add_hi,up_temp  ; REVERSE THE ROTATION
ld      up_temp,#64d         ;
sub     up_temp,force_add_hi

ld      force_add_hi,#^hb force_table_60
ld      force_add_lo,#^lb force_table_60
tm      p2,#00100000b      ; test the 50/60 bit
jr      nz,UP60
ld      force_add_hi,#^hb force_table_50
ld      force_add_lo,#^lb force_table_50

UP60

add     force_add_lo,up_temp  ; calculate the address add 2X temp
adc     force_add_hi,#00h    ;
add     force_add_lo,up_temp ; calculate the address add 2X temp
adc     force_add_hi,#00h    ;

di
ldc     up_force_hi,@force_add ; get hi byte
incw    force_add             ; get low byte
ldc     up_force_lo,@force_add ;
ei

GOT_FORCE:

ld      PWM_STATUS,#0FFH    ;
ld      pwm_count,#TOTAL_PWM_COUNT ; max count
ld      pulsewidth,#MIN_COUNT ; set initial pulsewidth
ld      dn_temp,#MIN_COUNT  ; start initial pw
ld      up_temp,#MIN_COUNT  ;

pwm_exit.
ld      t1,pulsewidth       ; load timer with pulse
pop     rp                  ; restore pointer
iret                       ; return from int

```

66	FORCE TABLE	
force_table_60:		
S_0	.word	0DACH
S_1	.word	0DACH
S_2	.word	0DC5H
S_3	.word	0DDEH
S_4	.word	0DF7H
S_5	.word	0E10H
S_6	.word	0E29H
S_7	.word	0E42H
S_8	.word	0E5BH
S_9	.word	0E6DH
S_10	.word	0E7FH
S_11	.word	0E91H
S_12	.word	0E9BH
S_13	.word	0EA5H
S_14	.word	0EAFH
S_15	.word	0EB9H
S_16	.word	0EC3H
S_17	.word	0ECDH
S_18	.word	0ED7H
S_19	.word	0EE1H
S_20	.word	0EEBH
S_21	.word	0EF5H
S_22	.word	0EFFH
S_23	.word	0F09H
S_24	.word	0F13H
S_25	.word	0F1DH
S_26	.word	0F27H
S_27	.word	0F31H
S_28	.word	0F3BH
S_29	.word	0F45H
S_30	.word	0F4FH
S_31	.word	0F59H
S_32	.word	0F63H
S_33	.word	0F6DH
S_34	.word	0F86H
S_35	.word	0F9FH
S_36	.word	0FB8H
S_37	.word	0FD0H
S_38	.word	0FEAH
S_39	.word	1003H
S_40	.word	101CH
S_41	.word	1035H
S_42	.word	104EH
S_43	.word	1067H
S_44	.word	1099H
S_45	.word	10CBH
S_46	.word	10FDH
S_47	.word	112FH
S_48	.word	1161H

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120

```
S_49      .word      1193H
S_50      .word      11C5H
S_51      .word      1229H
S_52      .word      125BH
S_53      .word      12BFH
S_54      .word      1323H
S_55      .word      13C1H
S_56      .word      14FCH
S_57      .word      16D6H
S_58      .word      194DH
S_59      .word      1C62H
S_60      .word      2014H
S_61      .word      2465H
S_62      .word      2954H
S_63      .word      2EE0H
S_64      word      2EE0H
```

```
FILL
FILL
FILL
FILL
FILL
FILL
FILL
FILL
FILL
FILL
FILL
```

end



What is claimed is:

1. A barrier operator for opening and closing a movable barrier, comprising:
  - a barrier drive;
    - means for detecting motion of the movable barrier; 5
    - means for detecting when a barrier command signal has been given to the barrier drive;
    - means for storing a commanded state of the barrier drive;
    - means for comparing the commanded state with the motion indicated by said barrier motion detection means, and for indicating if the motion conflicts with the commanded state; and 10
    - means for generating an alarm signal in response to the conflict indication of said comparing means. 15
2. A barrier operator for opening and closing a movable barrier according to claim 1, further comprising means for enabling the alarm signal generating means a preselected time interval following closure of the barrier. 20
3. A barrier operator for opening and closing a movable barrier according to claim 2, further comprising means for optically detecting the presence of an obstacle adjacent the barrier and producing an obstacle detection signal in response thereto, said obstacle detection means being inhibited in response to the means for enabling alarm signal generation. 25
4. A barrier operator for opening and closing a movable barrier according to claim 1, further comprising a barrier position detection switch for generating a barrier closure signal when the barrier is substantially closed and providing the barrier closure signal to the means for generating the alarm signal indicative of the fact that the barrier has been closed. 30
5. A barrier operator for opening and closing a movable barrier according to claim 1, further comprising means for causing the barrier drive to supply a closing force to the movable barrier in response to the alarm signal from the means for generating the alarm signal. 35
6. A barrier operator for opening and closing a movable barrier according to claim 5, further comprising means for the barrier drive to cease supplying a closing force after a predetermined time interval. 40
7. A barrier operator for controlling a movable barrier, comprising:
  - a down limit detector disposed to indicate whether said barrier is at a closed position or not; 45
  - memory means for storing one of a set of states of said barrier, the set of states including a CLOSED state indicating said barrier is closed;
  - alarm generation means, responsive to the barrier state stored by said memory means and said down limit detector, for generating an alarm signal when the stored barrier state is CLOSED and said down limit detector indicates said barrier is not at a closed position; and 50
  - alarm enabling means for enabling said alarm generation means a preselected time interval after said barrier is closed. 55
8. A barrier operator according to claim 7, wherein said alarm enabling means is responsive to an indication from said down limit detector that said barrier is closed for initiating the preselected time interval. 60
9. A barrier operator according to claim 7, further comprising:
  - down motor signal means, for providing a down motor signal in response to said alarm signal; and 65
  - a barrier drive responsive to said down motor signal for closing said barrier.

10. A barrier operator according to claim 9, further comprising:

obstacle detector for detecting an obstacle to movement of said barrier, and for generating an obstacle signal in response thereto; and

means for disabling said barrier drive in response to the obstacle signal.

11. A barrier operator according to claim 10, wherein said obstacle detector comprises:

an optical light emitter for emitting light; and

an optical light detector for receiving the light from said emitter, and generating a signal indicative of whether light is received from said emitter or not.

12. A barrier operator according to claim 9, wherein said alarm enabling means is disposed to continuously enable without a preselected time delay said alarm generation means after said alarm generation means has generated an alarm signal, and after said barrier drive has closed said barrier in response to said alarm signal.

13. A barrier operator according to claim 9, further comprising:

a barrier drive motion detector for detecting actual motion of said barrier drive and generating a motion signal indicative thereof; wherein

said alarm generation means receives the motion signal and generates the alarm signal when the stored barrier state is CLOSED, said down limit detector indicates said barrier is not at a closed position, and said motion detector indicates motion of said barrier drive.

14. A barrier operator according to claim 9, further comprising:

a command signal receiver for receiving a signal commanding said barrier to open, and generating an indication thereof; and

means for providing an up motor signal in response to the receiver indication; wherein

said barrier drive responds to the up motor signal by opening said barrier; and

said memory means stores a state selected from the set of barrier states, other than the CLOSED state, in response to the receiver indication.

15. A garage door operator for opening and closing a garage door, comprising:

a motor for moving the garage door;

a down limit detector, for indicating when the garage door is moved to a closed position by said motor;

timer means enabled by the indication from said down limit detector that the garage door is closed, disposed to indicate when a preselected interval has expired;

command signal means for receiving a commanded state of the garage door; and

a microprocessor responsive to said command signal means for causing said motor to move the garage door to the commanded state, disposed to cause the motor to close the garage door when said timer means indicates the preselected interval has expired, said down limit detector indicates the garage door is not closed, and said command signal means has not received a new commanded state.

16. A garage door operator according to claim 15, further comprising:

a tachometer for detecting rotation of said motor, and for providing an indication thereof to said microprocessor, wherein

said microprocessor is disposed to cause said motor to close the garage door when said timer means indicates the preselected interval has expired, said tachometer indicates said motor has rotated beyond a preselected threshold, and said command signal means has not received a new commanded state. 5

17. A garage door operator according to claim 15, further comprising:

an optical obstacle detector, for optically detecting the presence of an obstacle adjacent the garage door and

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producing an obstacle detection signal in response thereto, wherein

said microprocessor is responsive to the obstacle detection signal to cease causing said motor to close the garage door.

5

18. A garage door operator according to claim 15, wherein said command signal means comprises a radio frequency receiver.

\* \* \* \* \*

18. A barrier operator for opening and closing a movable barrier, comprising:

a barrier drive;

a motion detector for detecting motion of the movable barrier;

a command signal detector for detecting when a barrier command signal has been given to the barrier drive;

circuitry for storing a commanded state of the barrier drive;

a controller for comparing the commanded state with the motion indicated by said barrier motion detector, and for indicating if the motion conflicts with the commanded state; and

a signal generator for generating an alarm signal in response to the conflict indication of said controller.

19. A barrier operator for opening and closing a movable barrier according to claim 18, further comprising apparatus for enabling the alarm signal generator a preselected time interval following closure of the barrier.

20. A barrier operator for opening and closing a movable barrier according to claim 19, further comprising an obstacle detector for optically detecting the presence of an obstacle adjacent the barrier and producing an obstacle detection signal in response thereto, said obstacle detector being inhibited in response to the signal generator for enabling alarm signal generation.

21. A barrier operator for opening and closing a movable barrier according to claim 18, further comprising a barrier position detection switch for generating a barrier closure signal when the barrier is substantially closed and providing the barrier closure signal to the signal generator indicative of the fact that the barrier has been closed.

22. A barrier operator for opening and closing a movable barrier according to claim 18, further comprising apparatus for enabling the barrier drive to supply a closing force to

the movable barrier in response to the alarm signal from the signal generator for generating the alarm signal.

23. A barrier operator for opening and closing a movable barrier according to claim 22, wherein the barrier drive ceases supplying a closing force after a predetermined time interval.

24. A barrier operator for controlling a movable barrier, comprising:

a down limit detector disposed to indicate whether said barrier is at a closed position or not;

memory for storing one of a set of states of said barrier, the set of states including a CLOSED state indicating said barrier is closed;

an alarm generator, responsive to the barrier state stored by said memory and said down limit detector, for generating an alarm signal when the stored barrier state is CLOSED and said down limit detector indicates said barrier is not at a closed position; and

an alarm enabler for enabling said alarm signal generator a preselected time interval after said barrier is closed.

25. A barrier operator according to claim 24, wherein said alarm enabler is responsive to an indication from said down limit detector that said barrier is closed for initiating the preselected time interval.

26. A barrier operator according to claim 24, further comprising:

down motor circuitry, for providing a down motor signal in response to said alarm signal; and

a barrier drive responsive to said down motor signal for closing said barrier.

27. A barrier operator according to claim 26, further comprising:

obstacle detector for detecting an obstacle to movement of said barrier, and for generating an obstacle signal in response thereto; and for disabling said barrier drive in response to the obstacle signal.

28. A barrier operator according to claim 27, wherein said obstacle detector comprises:

an optical light emitter for emitting light; and  
an optical light detector for receiving the light from said emitter, and generating a signal indicative of whether light is received from said emitter or not.

29. A barrier operator according to claim 26, wherein said alarm enabler is disposed to continuously enable without a preselected time delay said alarm generator after said alarm generator has generated an alarm signal, and after said barrier drive has closed said barrier in response to said alarm signal.

30. A barrier operator according to claim 26, further comprising:

a barrier drive motion detector for detecting actual motion of said barrier drive and generating a motion signal indicative thereof; wherein

said alarm generator receives the motion signal and generates the alarm signal when the stored barrier state is CLOSED, said down limit detector indicates said barrier is not at a closed position, and said motion detector indicates motion of said barrier drive.

31. A barrier operator according to claim 26, further comprising:

a command signal receiver for receiving a signal commanding said barrier to open, and generating an indication thereof; and

circuitry for providing an up motor signal in response to

the receiver indication; wherein

said barrier drive responds to the up motor signal by opening said barrier; and

said memory stores a state selected from the set of barrier states, other than the CLOSED state, in response to the receiver indication.

32. A garage door operator for opening and closing a garage door, comprising:

a motor for moving the garage door;

a down limit detector, for indicating when the garage door is moved to a closed position by said motor;

a timer enabled by the indication from said down limit detector that the garage door is closed, disposed to indicate when a preselected interval has expired;

a command signal receiver for receiving a commanded state of the garage door; and

a microprocessor responsive to said command signal receiver for causing said motor to move the garage door to the commanded state, disposed to cause the motor to close the garage door when said timer indicates the preselected interval has expired, said down limit detector indicates the garage door is not closed, and said command signal receiver has not received a new commanded state.

33. A garage door operator according to claim 32, further comprising:

a tachometer for detecting rotation of said motor, and for providing an indication thereof to said microprocessor; wherein

said microprocessor is disposed to cause said motor to close the garage door when said timer indicates the preselected interval has expired, said tachometer indicates said motor has rotated beyond a preselected threshold, and said command signal receiver has not received a new commanded state.



34. A garage door operator according to claim 32, further comprising:

an optical obstacle detector, for optically detecting the presence of an obstacle adjacent the garage door and producing an obstacle detection signal in response thereto, wherein said microprocessor is responsive to the obstacle detection signal to cease causing said motor to close the garage door.

35. A garage door operator according to claim 32, wherein said command signal receiver comprises a radio frequency receiver.

36. A barrier operator for opening and closing a barrier comprising:

a command signal receiver for receiving barrier open and barrier close signals directing the opening or closing respectively of the barrier;

a barrier drive responsive to barrier open and barrier close signals for opening and closing the barrier, respectively;

a closed limit detector for sensing the closed state of the barrier; and

a barrier controller responsive to received command signals and the closed limit detector for generating an alarm signal when the barrier has been in the closed position and an attempt is made to raise the door when no door open command has been received.

37. A barrier operator according to claim 36 comprising a timer enabled by the closed limit detector for indicating that a predetermined period of time has passed.

38. A barrier operator according to claim 36 wherein the barrier drive responds to the alarm signal by applying a closing force to the barrier.

39. A method of controlling a movable barrier for movement between an open position and a closed position

comprising:

receiving barrier movement commands including barrier open commands directing opening movement of the barrier and barrier close commands directing a closing movement of the barrier;

moving the barrier to the closed position in response to a barrier close command;

sensing that the barrier has been moved to the closed position; and

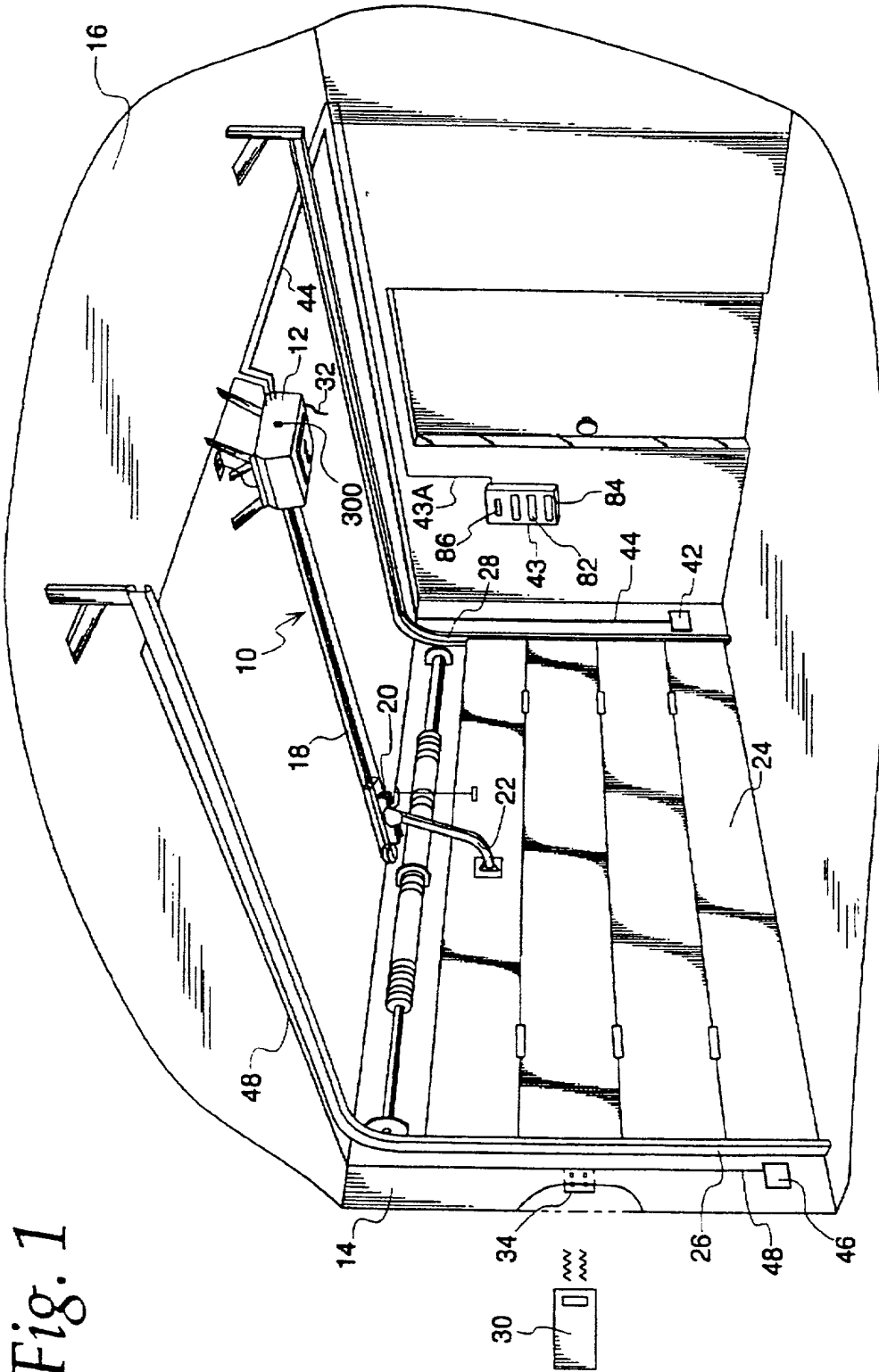
generating an alarm signal when the sensing step indicates that the barrier has moved from the closed position, and the receiving step does not indicate that a barrier open command has been received.

40. The method of claim 39 comprising directing closing movement of the barrier in response to the alarm signal.

A movable barrier or garage door operator has a barrier drive for moving the movable barrier or garage door between open and closed positions. Motion of the barrier is detected by a tachometer connected to the barrier drive or by upper and lower barrier travel limit switches. A test is made to determine if the barrier has been commanded to be in a closed state and to determine if a preselected time interval has elapsed following closure of the barrier. When both of those conditions are present and the door is moved upward without authorization an alarm signal is generated and can signal the barrier drive to apply a closing force. The timer prevents the barrier from being closed on a person or obstacle during normal operation and prevents injury. An obstacle detector also prevents unwanted closure on an obstacle.

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Fig. 1



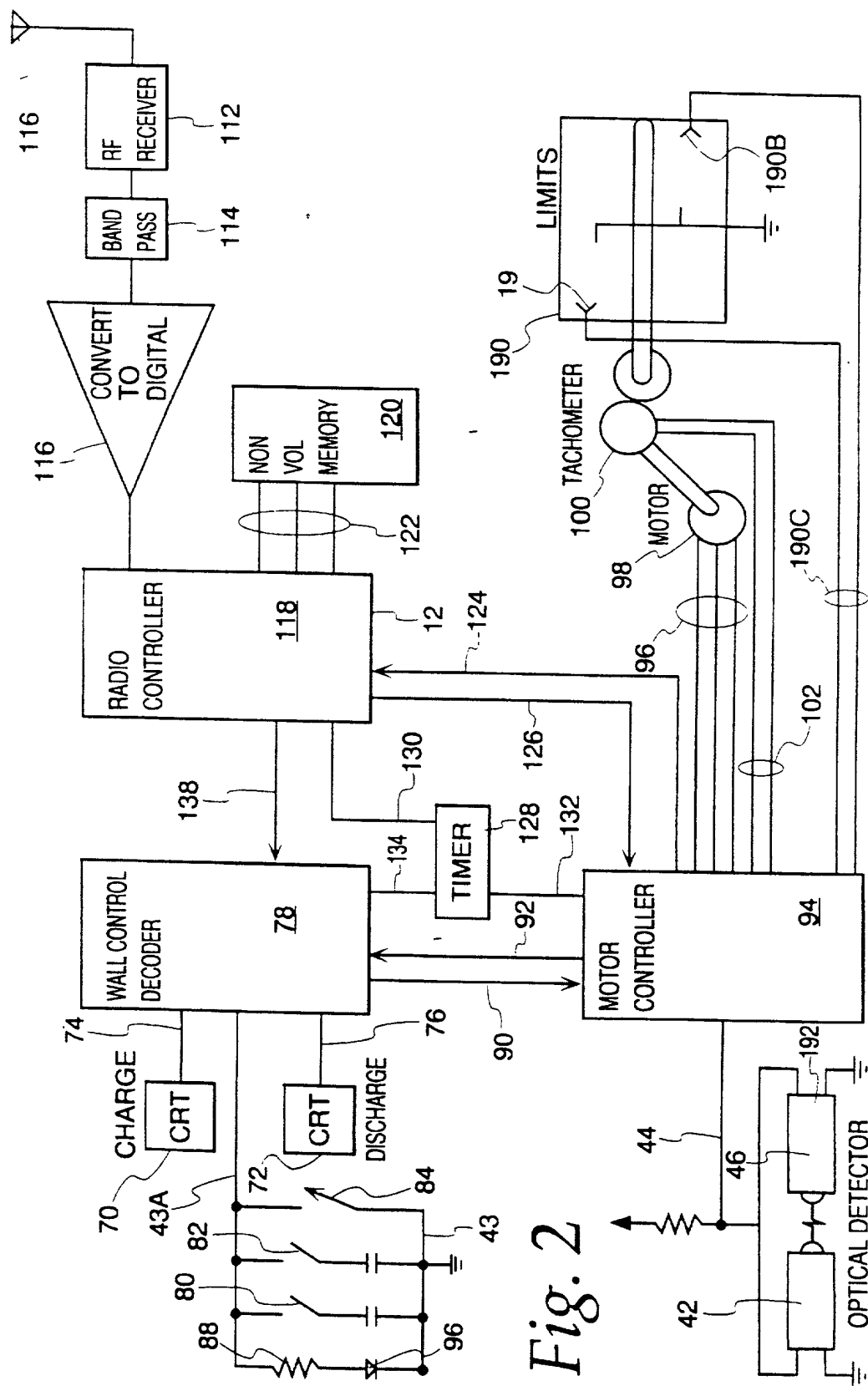
[illegible]

Fig. 2

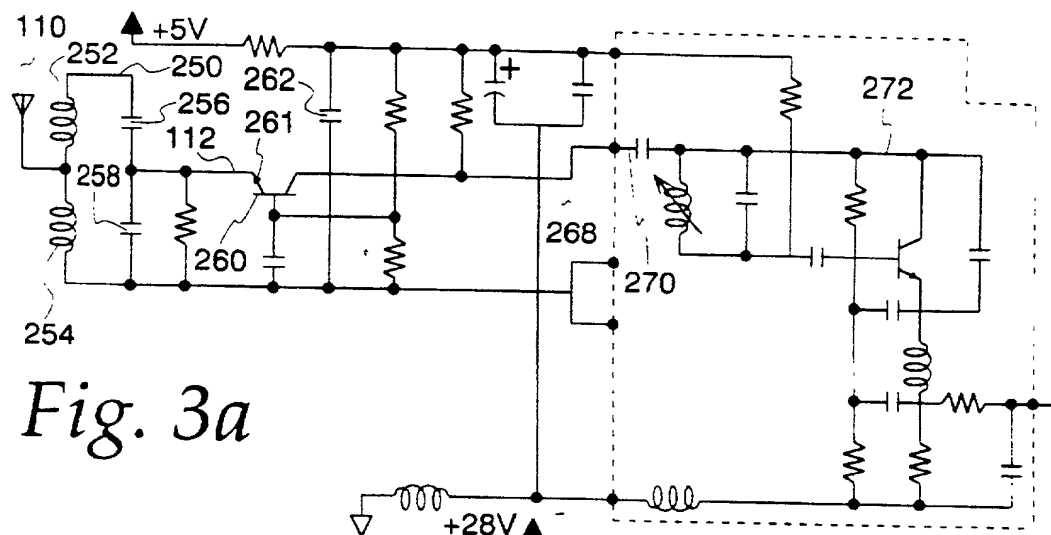
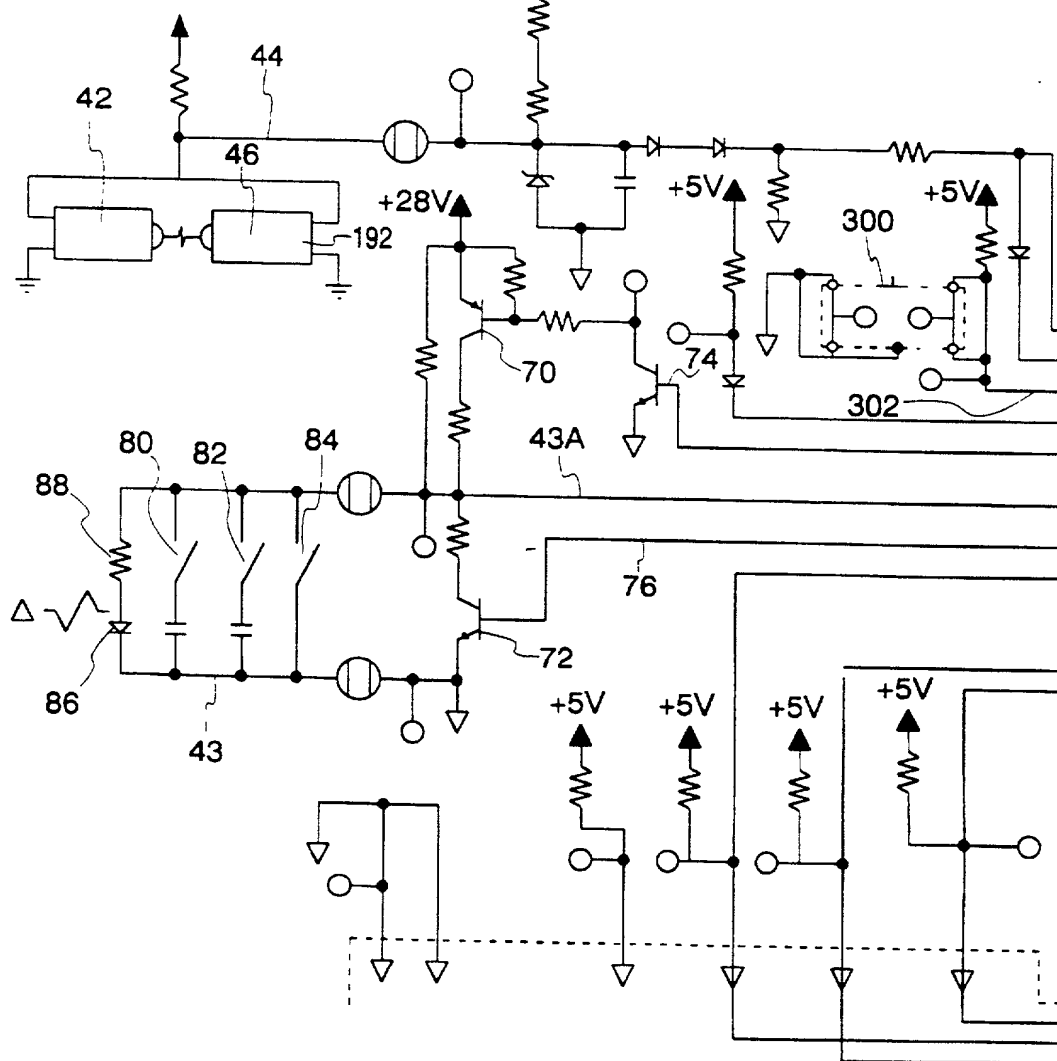


Fig. 3a



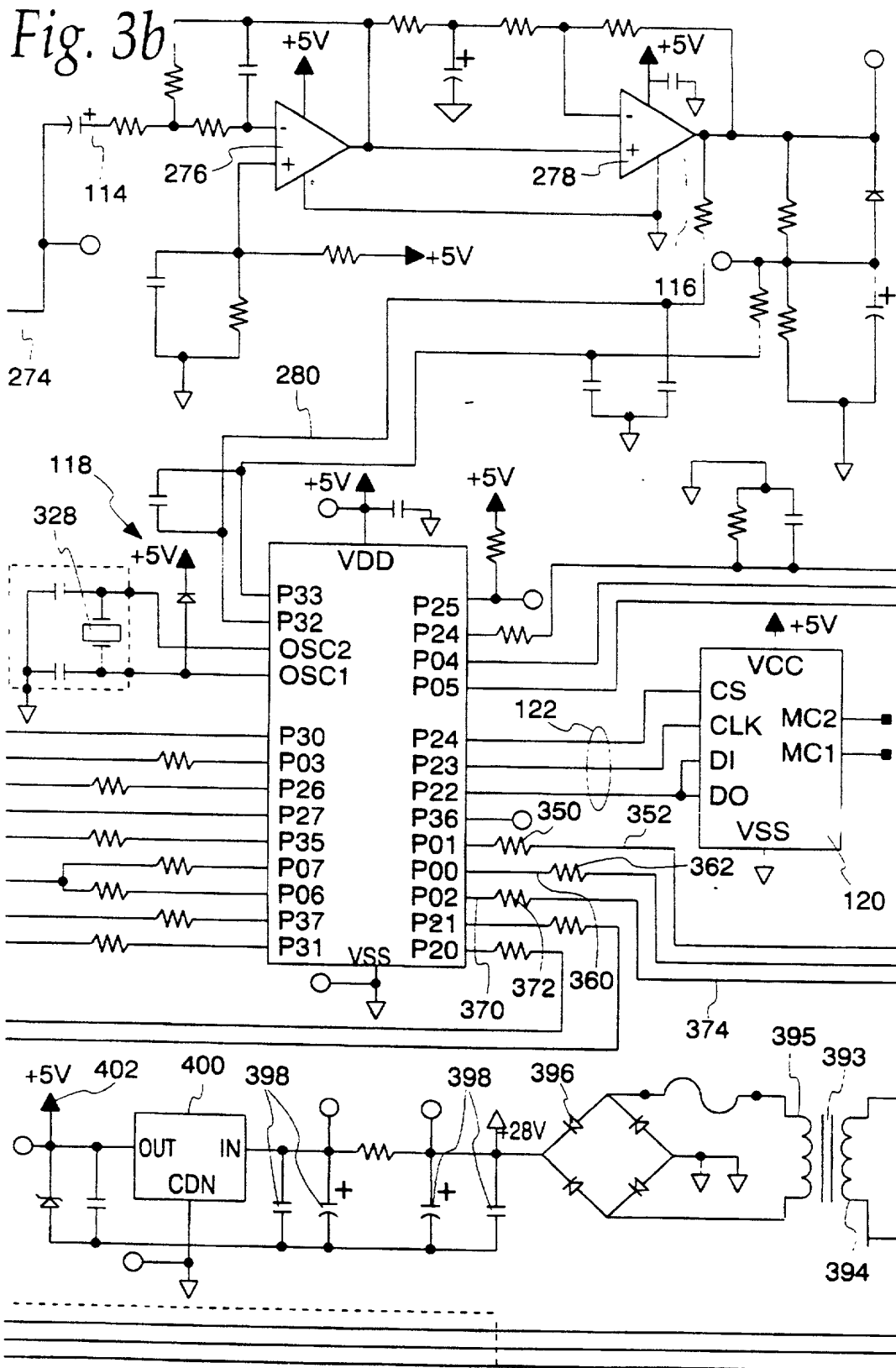
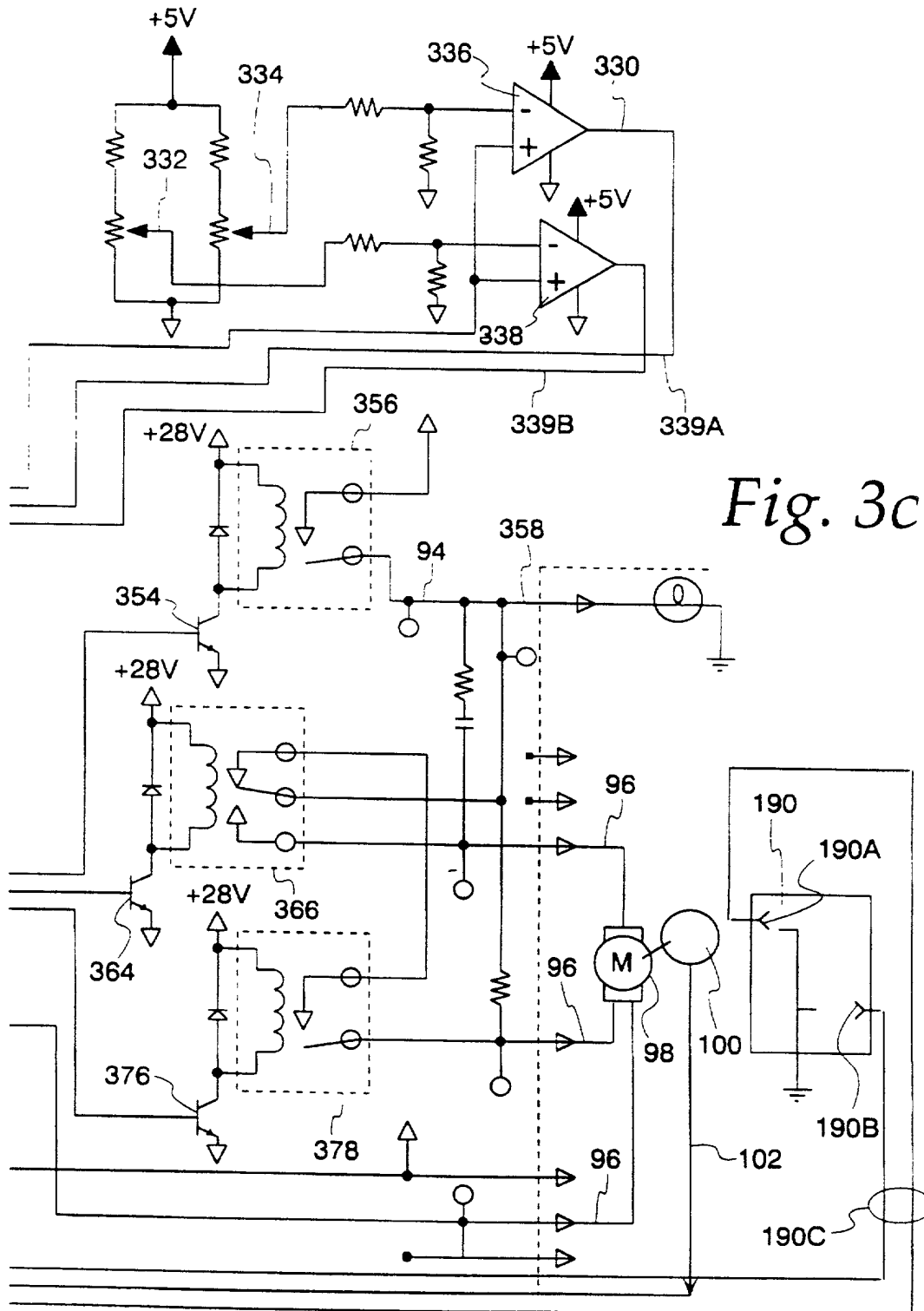


Fig. 3a	Fig. 3b	Fig. 3c
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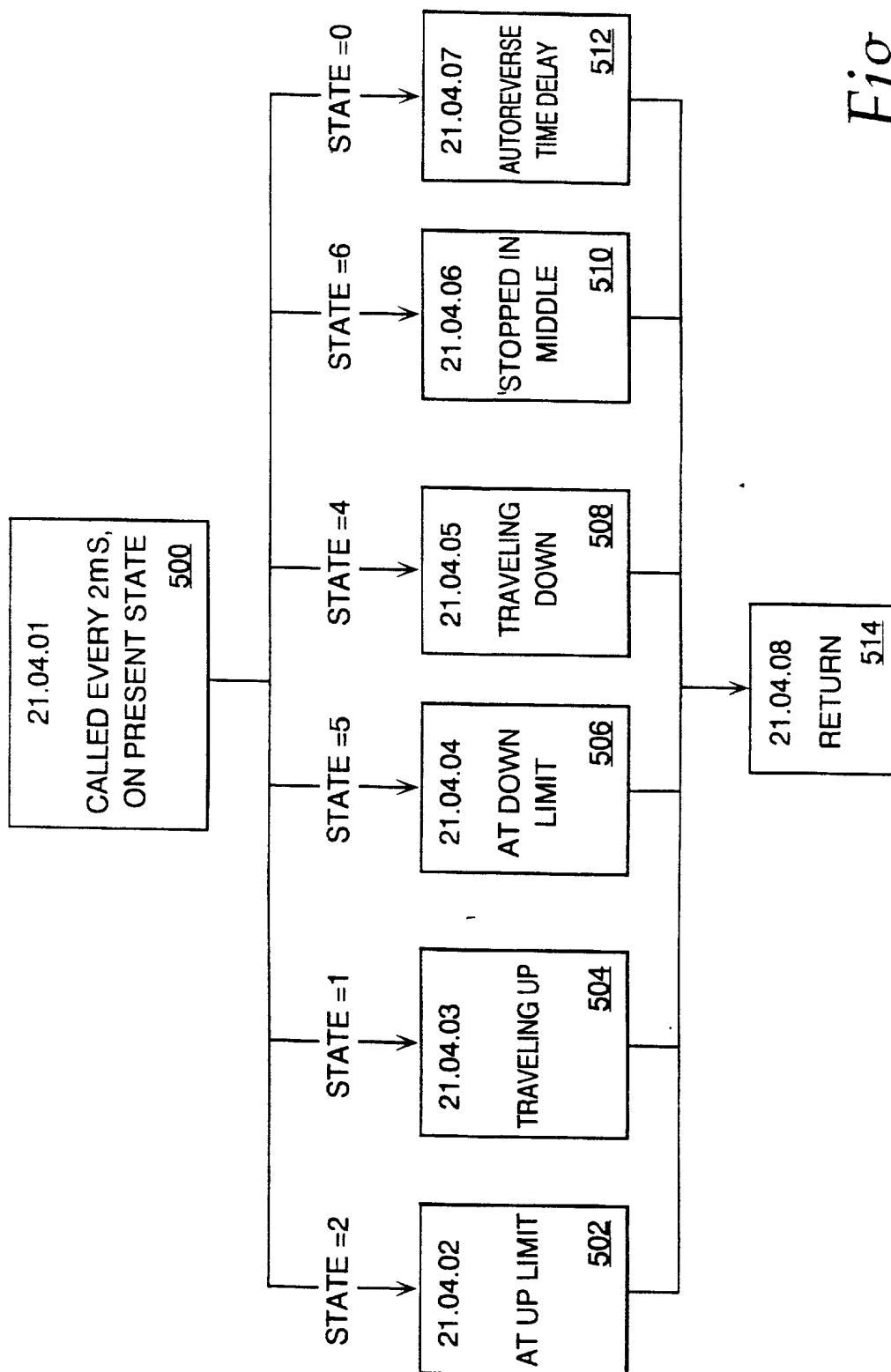
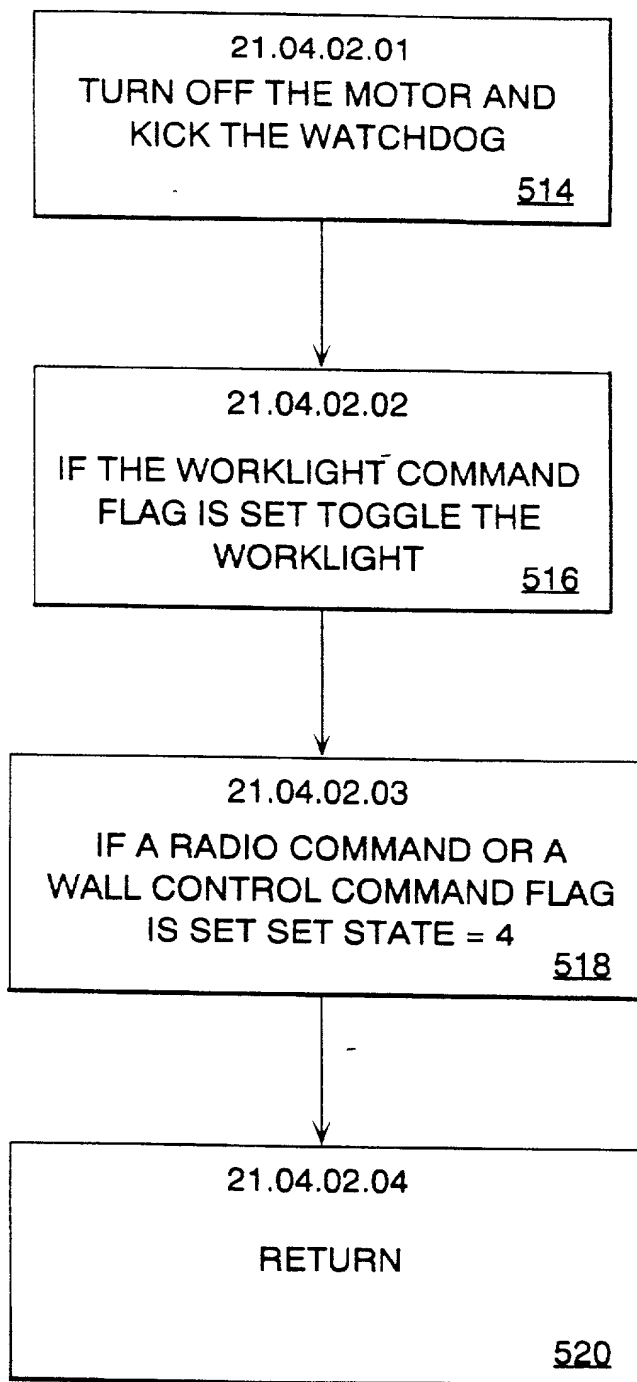


Fig. 4

502*Fig. 5*

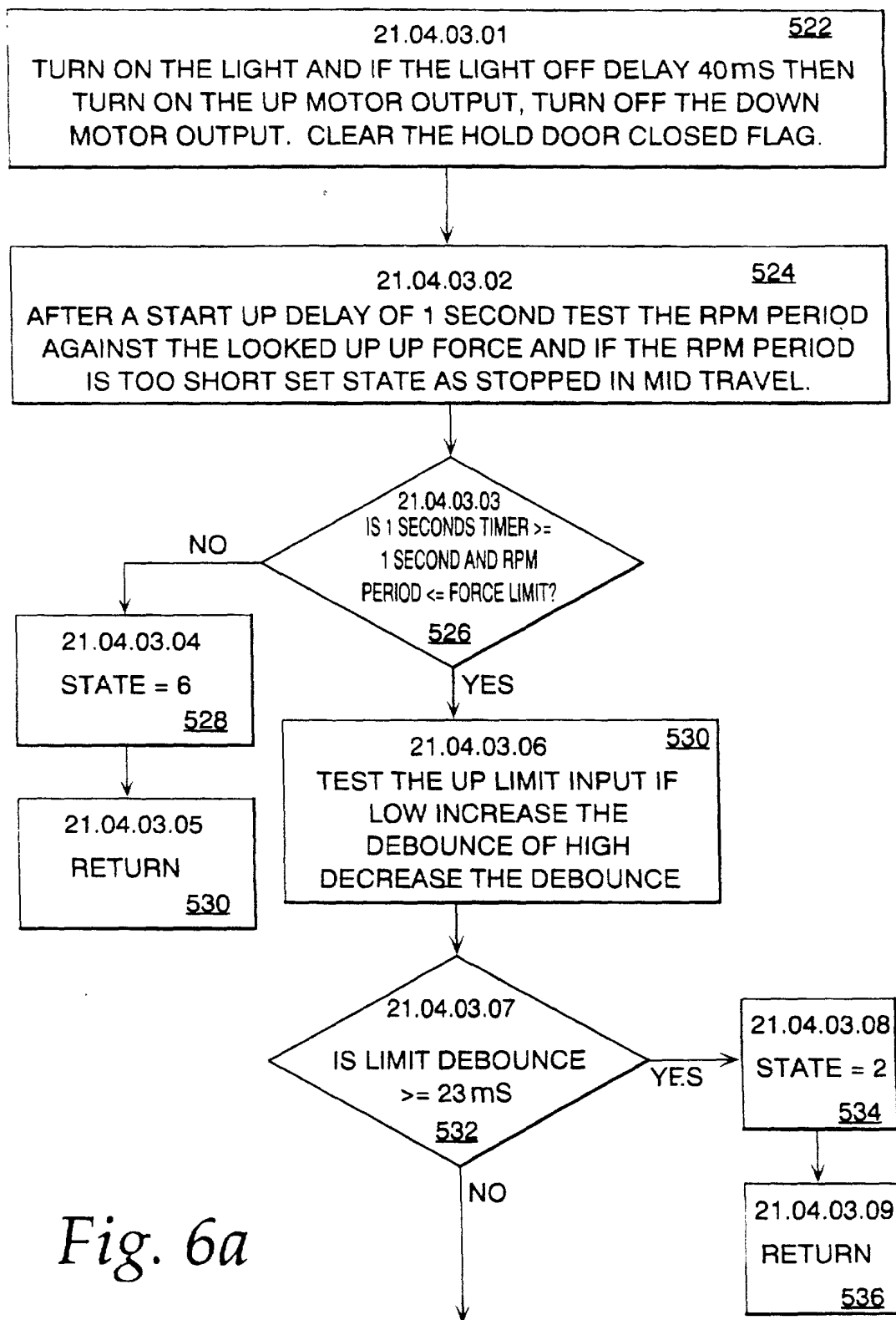
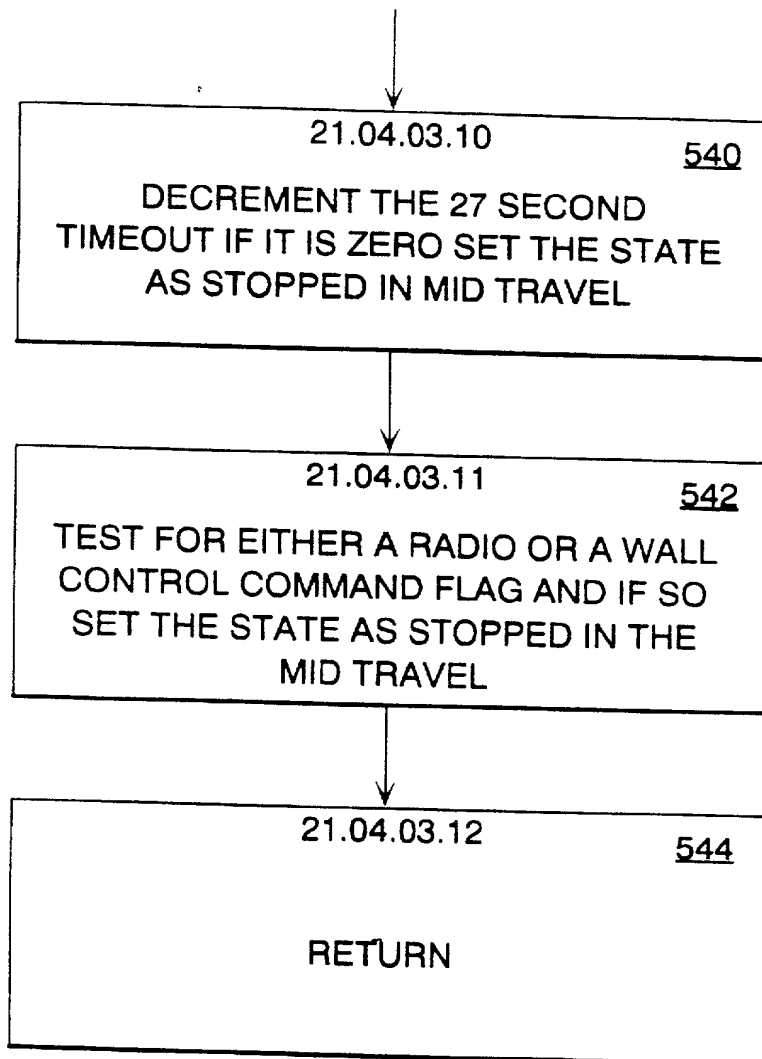


Fig. 6a

*Fig. 6b*

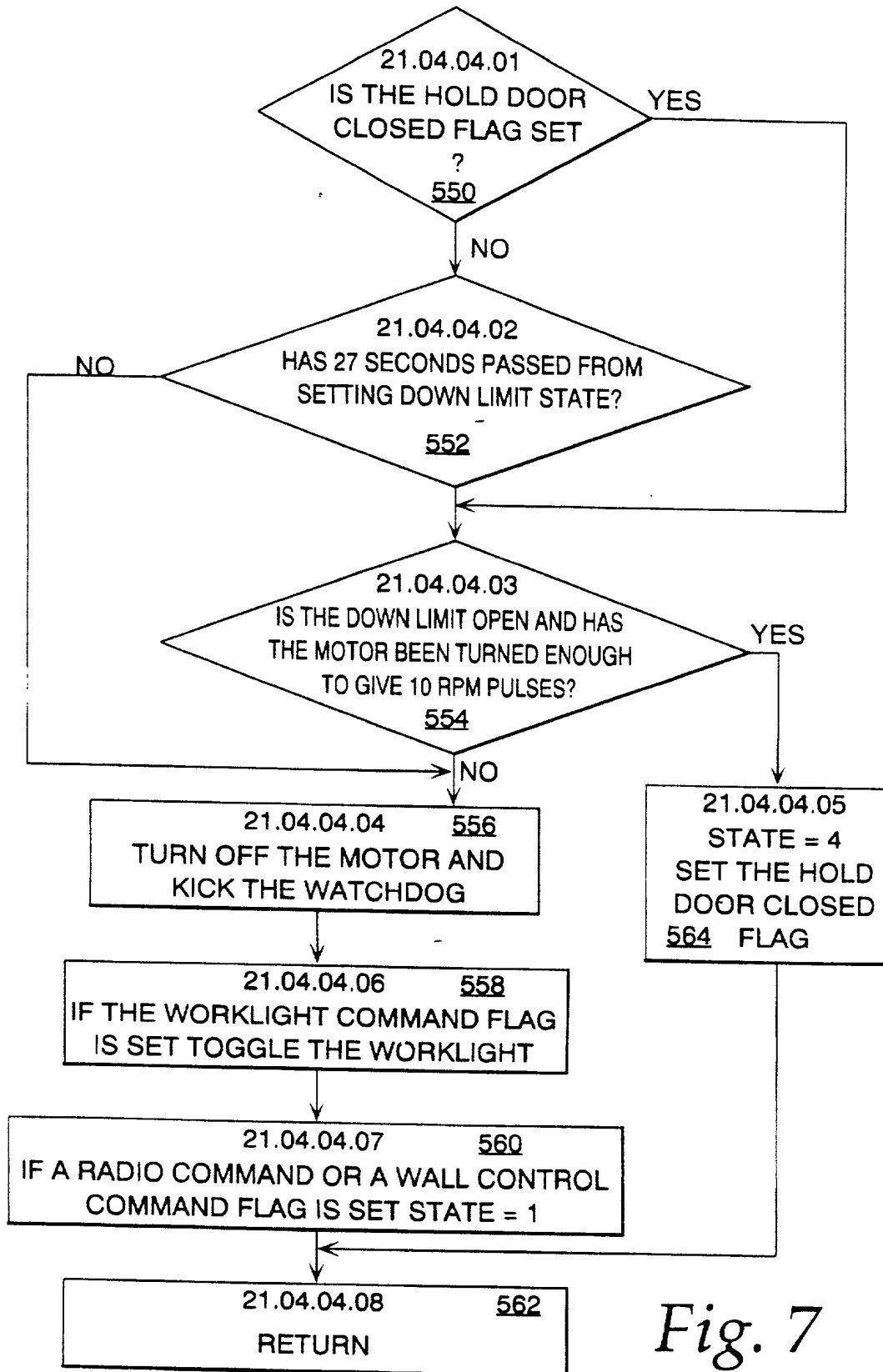
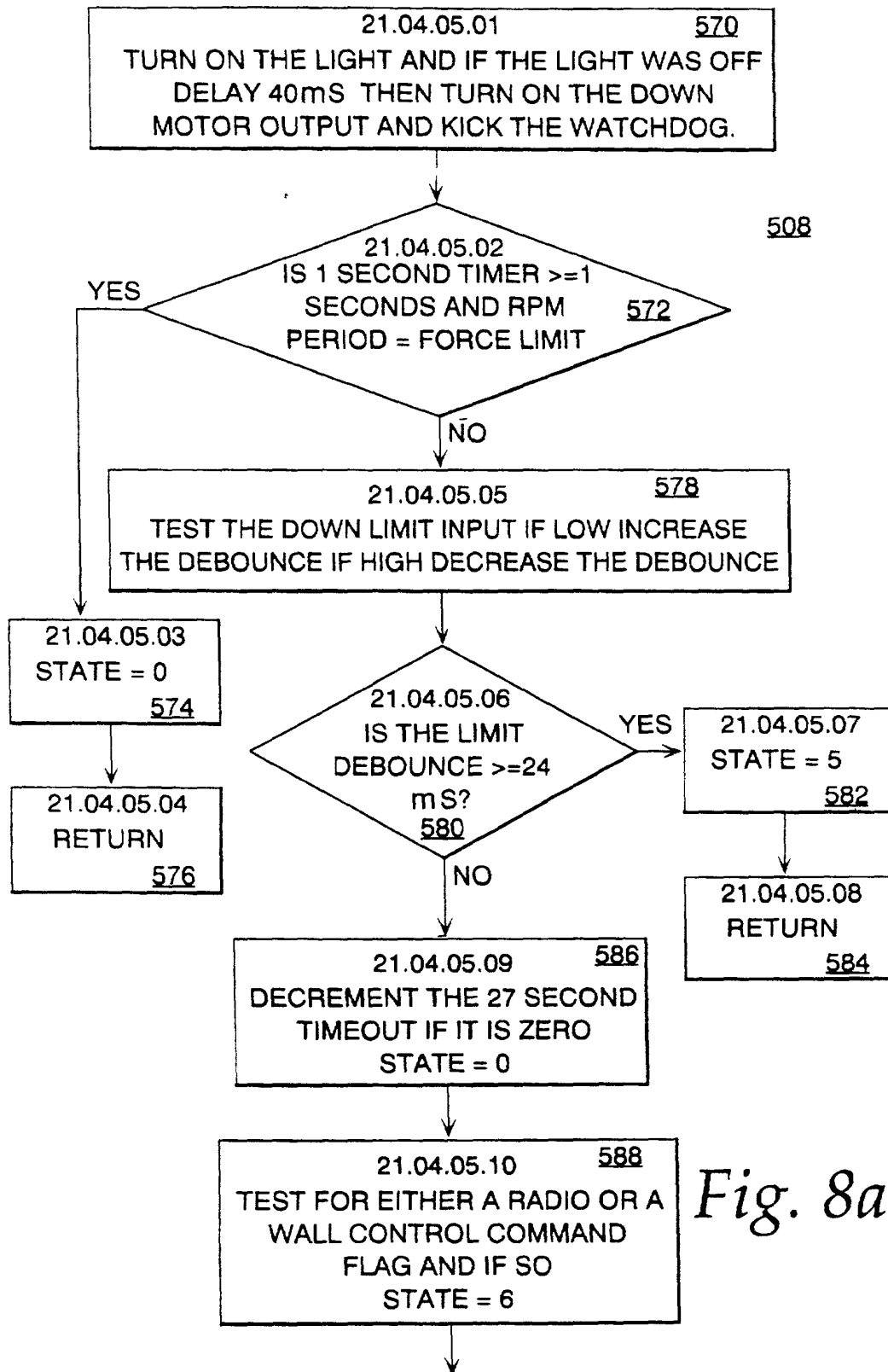
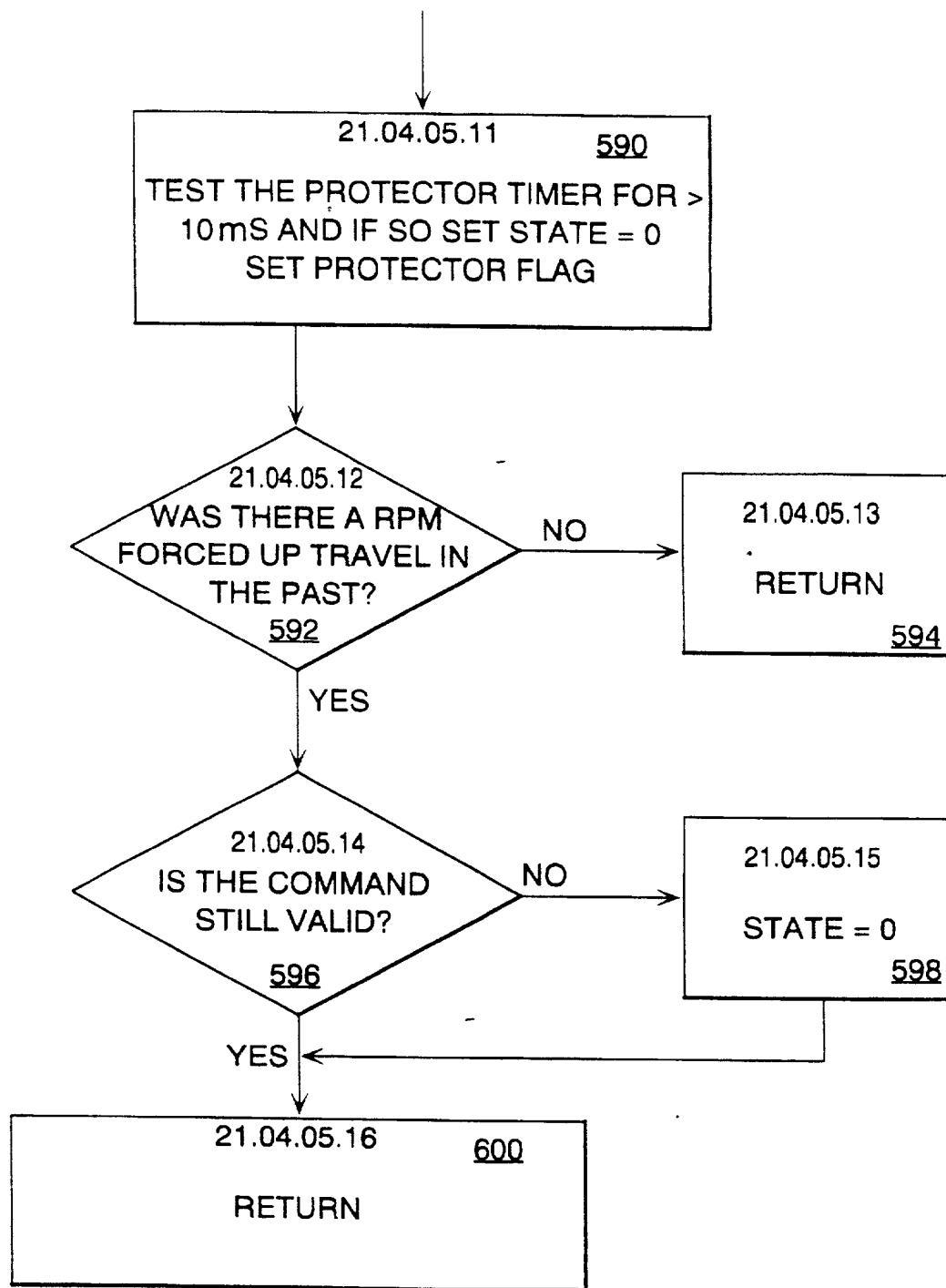
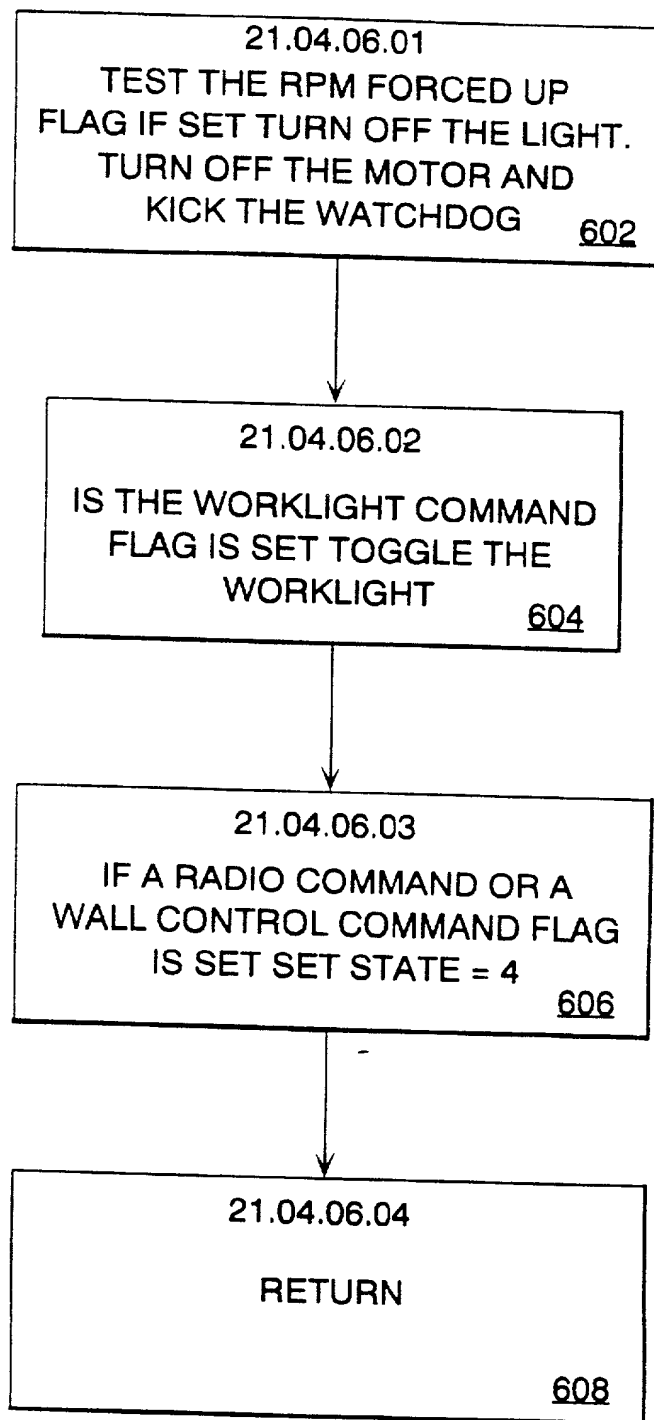


Fig. 7

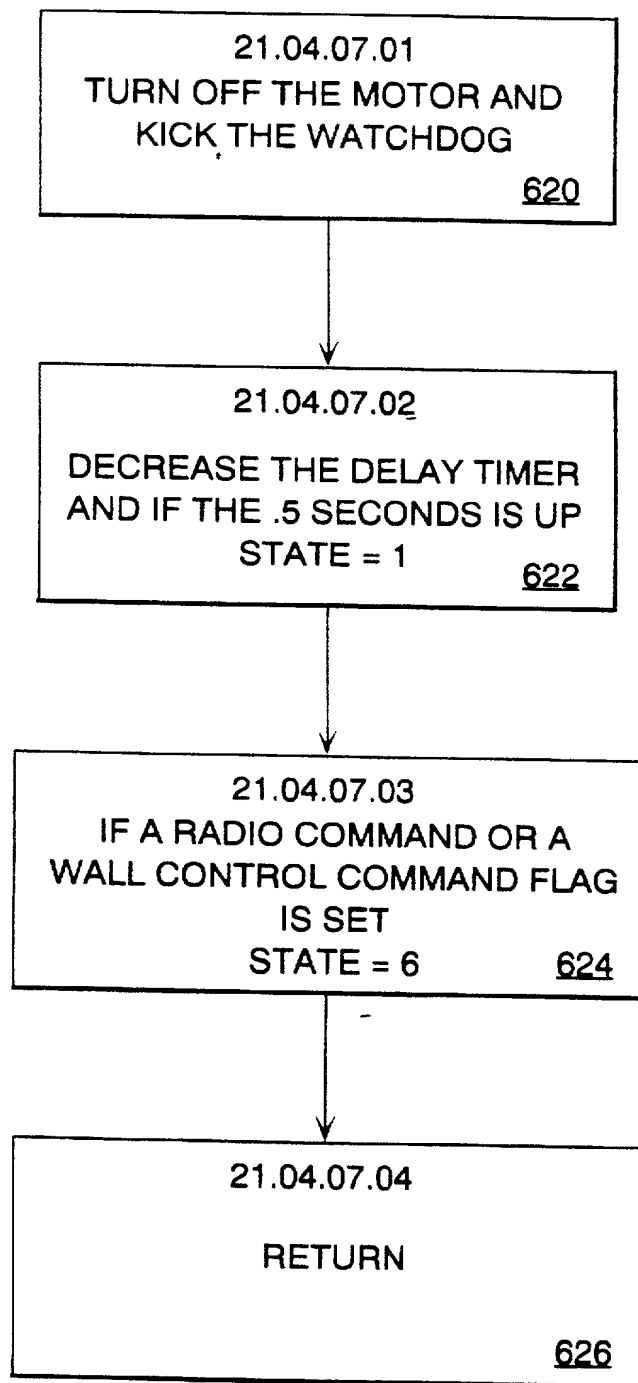
*Fig. 8a*

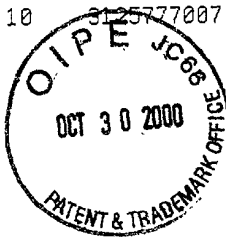
*Fig. 8b*

510

*Fig. 9*



512*Fig. 10*

REISSUE

ATTORNEY DOCKET NO. 68895

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Reissue ~~of~~ U.S. Patent  
No. 5,780,987

Applicants: James J. FITZGIBBON  
John V. MORAVEC

Application No.: 09/614,222

Filed: July 11, 2000

Title: BARRIER OPERATOR  
HAVING SYSTEM FOR  
DETECTING ATTEMPTED  
FORCED ENTRY

Group

Art Unit: 2837

Examiner:

CERTIFICATE OF MAILING

I hereby certify that this paper is being  
deposited with the U.S. Postal Service as  
first-class mail in an envelope addressed to:  
Commissioner of Patents and Trademarks,  
Washington, D.C. 20231.

10/26/00 Kenneth H. Joyl  
Date

Registration No.  
Attorney for Applicants

DECLARATION

BOX REISSUE

Honorable Commissioner of Patents  
and Trademarks

ATTENTION: Assistant Commissioner for Patents  
Washington, D.C. 20231

Dear Sir:

WE, JAMES J. FITZGIBBON and JOHN V. MORAVEC hereby declare  
that:

1. Our respective residences, post office addresses and  
citizenship are as stated below next to our names.

2. We verily believe ourselves to be the original, first  
and joint inventors of the subject matter which is claimed in the  
present application for which we solicit a reissue patent on the  
invention entitled "Barrier Operator Having System For Detecting  
Attempted Forced Entry."

Reissue of U.S. Patent 5,780,987  
Attorney Docket No. 68895

Appln. No. 09/614,222  
Filed July 11, 2000

3. We have reviewed and understand the content of the Specification, including the Claims of the present application.

4. The entire title of U.S. Letters Patent No. 5,780,987 entitled "BARRIER OPERATOR HAVING SYSTEM FOR DETECTING ATTEMPTED FORCED ENTRY" (the '987 patent) which issued July 14, 1998, is vested in The Chamberlain Group, Inc.

5. We acknowledge the duty to disclose information which is material to the examination of the present application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

6. There is no foreign application for patent or inventor's certificate on this invention filed by us or our legal representatives or assigns having a filing date before that of any application on which priority is claimed.

7. We believe the aforesaid Letters Patent 5,780,987 to be wholly or partly inoperative by reason of our claiming less than we had a right to claim in the patent. More specifically, the claims of Patent No. 5,780,987 are all drawn to apparatus and do not include method claims. Further, the independent claims are all unduly limited by including recitation of apparatus for sensing barrier motion and/or a timer for enabling alarm signal generation.

8. The above errors arose without any deceptive intention on our part.

9. All statements made herein of our own knowledge are true and all statements made on information and belief are believed to be true; and further these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.



Reissue of U.S. Patent No. 5,780,887  
Attorney Docket No. 68895

Appln. No. 09/614,222  
Filed July 11, 2000

Full name of sole or one  
Joint inventor

James J. Fitzgibbon

Inventor's Signature

*James J. Fitzgibbon*

Date:

10/11/00

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(City and State for U.S. Residents:  
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Streamwood, Illinois 60107

Citizenship:

U.S.A.

Full name of sole or one  
Joint inventor

John V. Moravec

Inventor's Signature

*John V. Moravec*

Date:

10/18/00

Residence:

Egg Harbor, Wisconsin

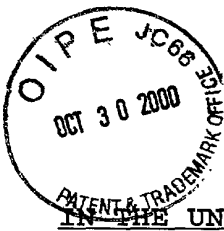
(City and State for U.S. Residents:  
City and County for Others)

Post Office Address:

4906 Court Road  
Egg Harbor, WI 54209

Citizenship:

U.S.A.



REISSUE  
ATTORNEY DOCKET NO. 68895

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Reissue of U.S. Patent  
No. 5,780,987

Applicants: James J. FITZGIBBON  
John V. MORAVEC

Application No.: 09/614,222

Filed: July 11, 2000

Title: BARRIER OPERATOR  
HAVING SYSTEM FOR  
DETECTING ATTEMPTED  
FORCED ENTRY

Group  
Art Unit: 2837

Examiner:

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deposited with the U.S. Postal Service as  
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Commissioner of Patents and Trademarks,  
Washington, D.C. 20231.

10/26/2000  
Date

*Kenneth H. Samples*  
Kenneth H. Samples  
Registration No. 25,747  
Attorney for Applicants

DECLARATION

BOX REISSUE

Honorable Commissioner of Patents  
and Trademarks

ATTENTION: Assistant Commissioner for Patents  
Washington, D.C. 20231

Dear Sir:

WE, JAMES J. FITZGIBBON and JOHN V. MORAVEC hereby declare  
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1. Our respective residences, post office addresses and  
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Full name of sole or one  
joint inventor:

James J. Fitzgibbon

Inventor's signature:

James J. Fitzgibbon

Date:

Oct 25 2000

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1521 Hadley

Batavia, Illinois 60510

Citizenship:

U.S.A.

Full name of sole or one  
joint inventor:

John V. Moravec

Inventor's signature:

Date:

Residence:

Egg Harbor, Wisconsin  
(City and State for U.S. Residents;  
City and Country for others);

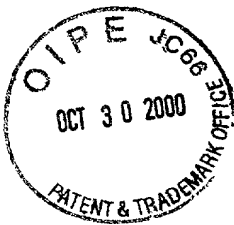
Post Office Address:

4906 Court Road

Egg Harbor, WI 54209

Citizenship:

U.S.A.



PATENT APPLICATION

Attorney Docket No. 68895

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: FITZGIBBON et al.

Appln No.: 09/614,222

Filed: July 11, 2000

For: BARRIER OPERATOR HAVING SYSTEM  
FOR DETECTING ATTEMPTED FORCED  
ENTRY

CERTIFICATE OF MAILING

I hereby certify that this paper is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on this date.

10/26/2000  
Date

Kenneth H. Samples  
Kenneth H. Samples  
Registration No. 25,747  
Attorney for Applicant(s)

RESPONSE TO NOTICE TO FILE MISSING PARTS

Box MISSING PARTS

Commissioner of Patents and Trademarks

ATTENTION: Assistant Commissioner for Patents  
Washington, D.C. 20231

Sir:

In response to the Notice to File Missing Parts dated July 27, 2000, enclosed are:

- (X) A copy of the Notice to File Missing Parts.
- (X) Executed Declarations for patent application, including Power of Attorney.
- (X) A Petition for one month Extension of Time with check in the amount of \$110.00 to cover the Extension of Time fee under 37 C.F.R. §1.17(a)(1).
- ( ) Assignment(s) of the invention to \_\_\_\_\_, and Recordation Form Cover Sheet - Patents Only - Form PTO-1595.
- ( ) A check in the amount of \$\_\_\_\_\_ to cover the fee for recording the assignment(s).





(X) Fee Calculation:  
Fee Calculation For Claims As Filed

( ) Provisional Application Basic Fee \$ 150.00 \$ \_\_\_\_\_  
• Surcharge under 37 C.F.R. §1.16(1) \$ 50.00 \$ \_\_\_\_\_

or

(X) Non-Provisional Utility Application \$710.00 \$ 710.00  
Basic Fee

• Independent 8 - 3 = 5 x \$ 80.00 = \$ 400.00  
Claims  
• Total Claims 40 - 20 = 20 x \$ 18.00 = \$ 360.00  
• Fee for Multiply Dependent Claims x \$270.00 = \$ \_\_\_\_\_  
• Surcharge under 37 C.F.R. §1.16(e) x \$130.00 = \$ 130.00

or

( ) Design Application Basic Fee \$320.00 \$ \_\_\_\_\_  
• Surcharge under 37 C.F.R. §1.16(e) \$130.00 \$ \_\_\_\_\_

Total Filing and/or Surcharge Fee \$ 1,600.00

( ) Small Entity Fee (reduced by half) \$ \_\_\_\_\_

( ) Statement(s) of Status as Small Entity.

(X) A check in the amount of \$ 1,600.00 to cover the Filing and/or Surcharge Fee is enclosed.

( ) Charge \$ \_\_\_\_\_ to Deposit Account No. 06-1135.

(X) The Commissioner is hereby authorized to charge any additional fees which may be required in this application under 37 C.F.R. §§1.16-1.17 during its entire pendency, or credit any overpayment, to Deposit Account No. 06-1135. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 06-1135. This sheet is filed in triplicate.

October 26, 2000  
(Date)

Kenneth H. Samples  
Kenneth H. Samples  
Registration No. 25,747

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